

## Appendix C - Hydrologic Model Calibration

## C.1 Introduction

Record event precipitation was applied in the models for the various precipitation gages as shown in Plate C.1. Nine (9) stream gage locations, also shown in Plate C.1 were used in the calibration analysis which included the hydraulic routing analysis which provide stage data for gages without rating curves. Plate C.2 through Plate C.10 report the comparison of the stream gage measured values to the event predicted values for these gages respectively: 1603, 1605, 1607, 1609, 1611, 1619, 1623, 1626, and 1630. The following items are compared for all gage locations:

*HMS Predict:* The raw hydrology analysis predicted flow rates. These flow rates are fed into the hydraulic routing analysis which produces results for a more detailed attenuation analysis.

*Gage Measured:* The gage reported stage values were converted to a hydrograph using the best fit rating curve values.

*HEC-RAS:* The results of the calibrated hydraulic routing analysis for the predicted storm response.

## C.2 January 1995 Event

For the January 1995 event, calibration analysis was performed using the Plan's 1992 baseline analysis. The January 1995 event (which is the largest event of record for the Dry Creek watershed) had sufficient gage records that a calibration analysis was performed. Twelve (12) rain gages within the watershed reported valid and continuous results for this storm event and were used in the calibration analysis. Graphs of the gage recorded precipitation are shown in Plate C.11. Plate C.11 graphs the SWMM precipitation rating curves for the elevation of each gage against the peak precipitation recorded for each time interval. These graphs are used to determine the precipitation event rating for each gage. For the January 1995 event, the precipitation ratings vary from a 50-year event to more than a 500-year event.

The stream gage locations within the Dry Creek watershed are shown on Plate C.13. Plate C.14 compares the results of the Hydraulic Routing (HEC-RAS) analysis rating curve for each gage location to a best fit curve. The best fit curve was used to convert the reported stage values to flow rates for comparison to the predicted flow rates of the calibrated analysis. In some cases, the gages also reported a previously converted flow rate, and in those cases the internal gage rating curve used to convert stage to flow rate is also presented.

Plate C.15 presents the comparison of the calibrated analysis to the record analysis for this event through the peak flow period of the event. In some cases, where an internal gage rating curve was available, the "Gage Measured" curve is directly reporting the



gage values. In these cases, a “Gage Adjusted” curve is added to the graphs to depict the values that would result if the best fit curve were used to report the flow rates. In most cases this curve would better represent the peak flow rates as the best fit curve was developed based on the hydraulics demonstrated in the Hydraulic Routing analysis.

The results of the analysis demonstrate the Plan Update models adequately predict the peak flood timing, scale, volume and response for this event.

### C.3 December 1995 Event

For the December 1995 event, the calibration analysis was performed using the Plan Update’s 1992 baseline analysis hydrology and hydraulic routing models.

The December 1995 event demonstrates the calibration of the Plan Update analysis for a smaller flood event. Eleven (11) rain gages within the watershed reported valid and continuous results for this storm event and were used in the calibration analysis. Gage 1608 had corrupted data and was not used.

Graphs of the gage recorded precipitation are shown in Plate C.16. Plate C.17 graphs the SWMM precipitation rating curves for the elevation of each gage against the peak precipitation recorded for each time interval. These graphs are used to determine the precipitation event rating for each gage. For the December 1995 event, the precipitation ratings vary from a 2-year event to a 5-year event.

The stream gage locations within the Dry Creek watershed are shown on Plate C.13. Plate C.18 presents the comparison of the calibrated analysis to the record analysis for this event through the peak flow period of the event. In some cases, where an internal gage rating curve was available, the “Gage Measured” curve is directly reporting the gage values. In these cases, a “Gage Adjusted” curve is added to the graphs to depict the values that would result if the best fit curve were used to report the flow rates. In most cases this curve would better represent the peak flow rates as the best fit curve was developed based on the hydraulics demonstrated in the Hydraulic Routing analysis. Plate C.19 presents the entire flood event hydrographs.

The results of the analysis demonstrate the Plan Update models adequately predict the peak flood timing, scale, volume and response for this event.

### C.4 January 1997 Event

For the January 1997 event, the calibration analysis was performed using the Plan’s 1992 baseline analysis hydrology and hydraulic routing models.

The January 1997 event demonstrates the calibration of the Plan Update analysis for a smaller flood event. Eleven (11) rain gages within the watershed reported valid and continuous results for this storm event and were used in the calibration analysis. Gage 1608 had corrupted data and was not used.



Graphs of the gage recorded precipitation are shown in Plate C.20. Plate C.21 graphs the SWMM precipitation rating curves for the elevation of each gage against the peak precipitation recorded for each time interval. These graphs are used to determine the precipitation event rating for each gage. For the January 1997 event, the precipitation ratings vary from a 5-year event to a 50-year event.

The stream gage locations within the Dry Creek watershed are shown on Plate C.13. Plate C.22 presents the comparison of the calibrated analysis to the record analysis for this event through the peak flow period of the event. In some cases, where an internal gage rating curve was available, the “Gage Measured” curve is directly reporting the gage values. In these cases, a “Gage Adjusted” curve is added to the graphs to depict the values that would result if the best fit curve were used to report the flow rates. In most cases this curve would better represent the peak flow rates as the best fit curve was developed based on the hydraulics demonstrated in the Hydraulic Routing analysis. Plate C.23 presents the entire flood event hydrographs.

The results of the analysis demonstrate the Plan Update models adequately predict the peak flood timing, scale, volume and response for this event.

## C.5 December 2005 Event

For the December 2005, the calibration analysis was performed using the Plan Update’s 2007 analysis hydrology and hydraulic routing models.

The December 2005 is remembered as the “New Years Eve” event because the storm came early in the morning on New Years Eve. The event demonstrates the calibration of the Plan Update analysis for moderate flood event. Eleven rain gages within the watershed reported valid and continuous results for this storm event and were used in the calibration analysis.

Graphs of the gage recorded precipitation are shown in Plate C.24. Plate C.25 graphs the SWMM precipitation rating curves for the elevation of each gage against the peak precipitation recorded for each time interval. These graphs are used to determine the precipitation event rating for each gage. For the December 2005 event, the precipitation ratings vary from a 2-year event to a 50-year event.

The stream gage locations within the Dry Creek watershed are shown on Plate C.13. Plate C.26 presents the comparison of the calibrated analysis to the record analysis for this event through the peak flow period of the event. In some cases, where an internal gage rating curve was available, the “Gage Measured” curve is directly reporting the gage values. In these cases, a “Gage Adjusted” curve is added to the graphs to depict the values that would result if the best fit curve were used to report the flow rates. In most cases this curve would better represent the peak flow rates as the best fit curve was developed based on the hydraulics demonstrated in the Hydraulic Routing analysis. Plate C.27 presents the entire flood event hydrographs.



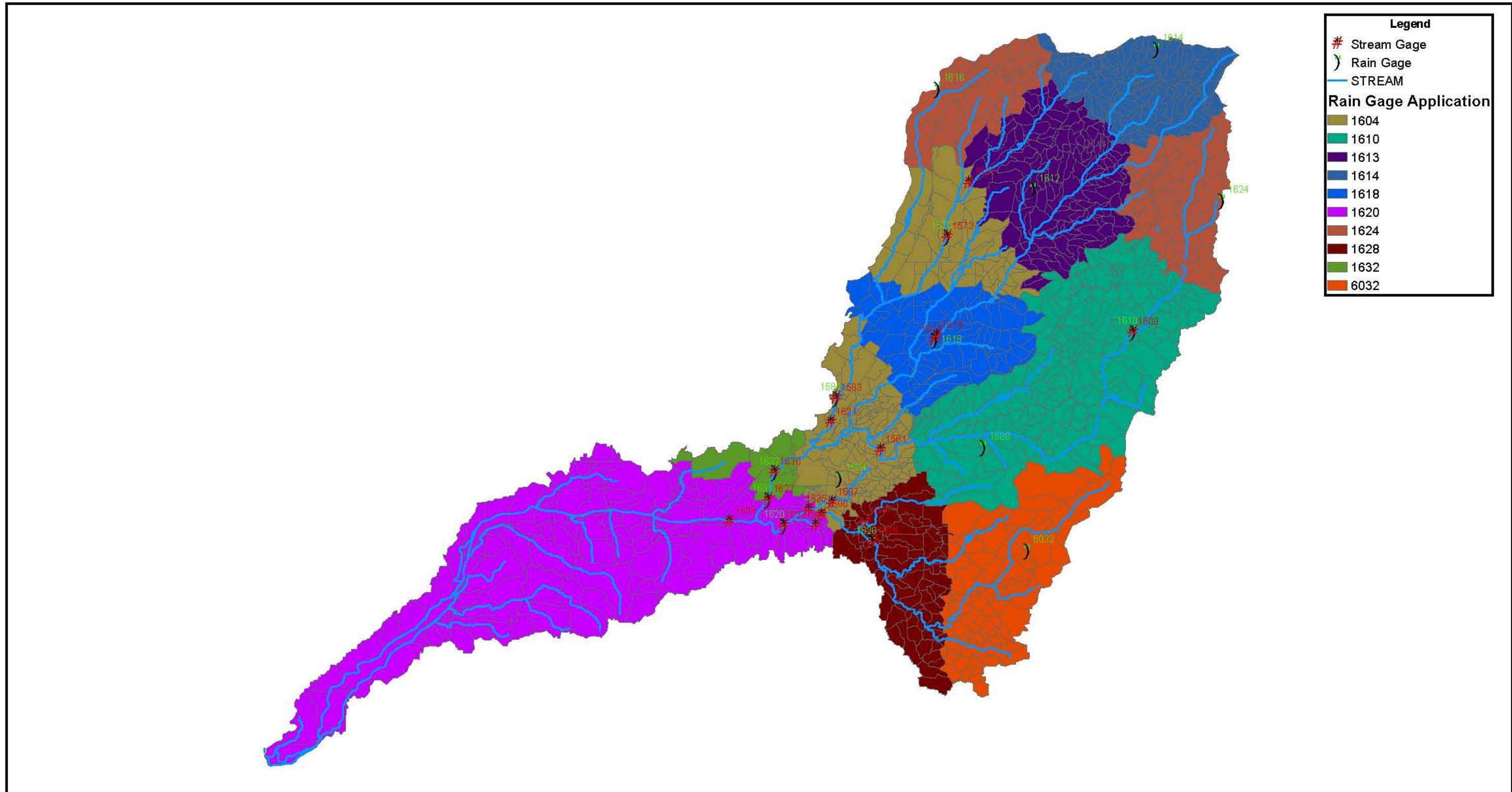
The results of the analysis demonstrate the Plan Update models adequately predict the peak flood timing, scale, volume and response for this event.

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# RAIN GAGE APPLICATION TO WATERSHED FOR CALIBRATION ANALYSIS



PLACER COUNTY FLOOD CONTROL AND WATER  
CONSERVATION DISTRICT



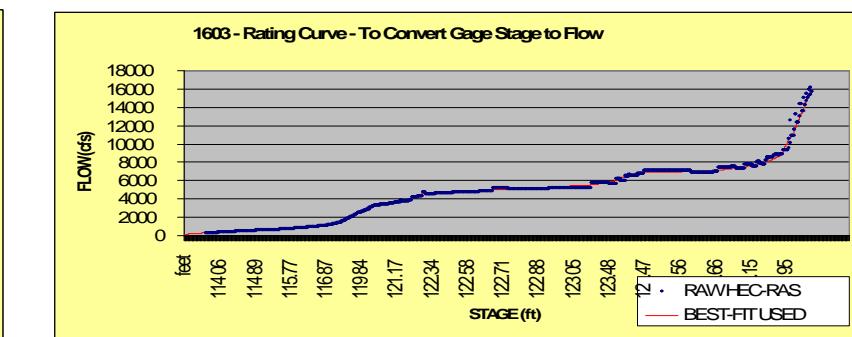
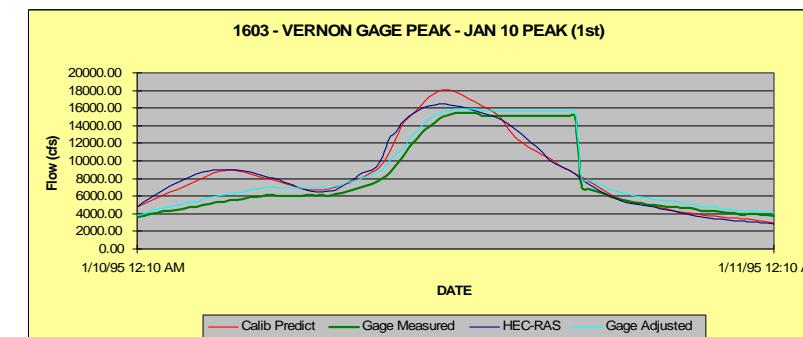
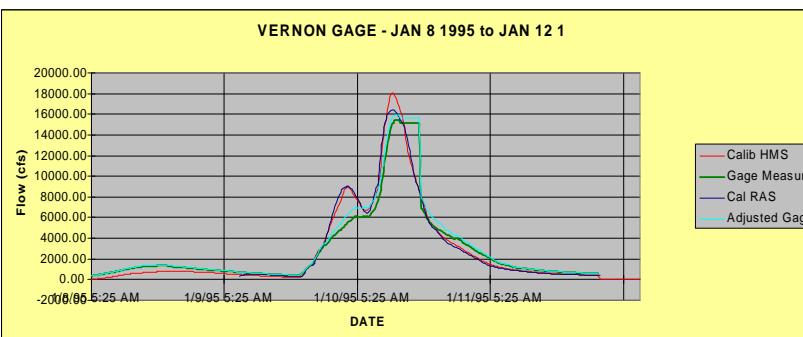
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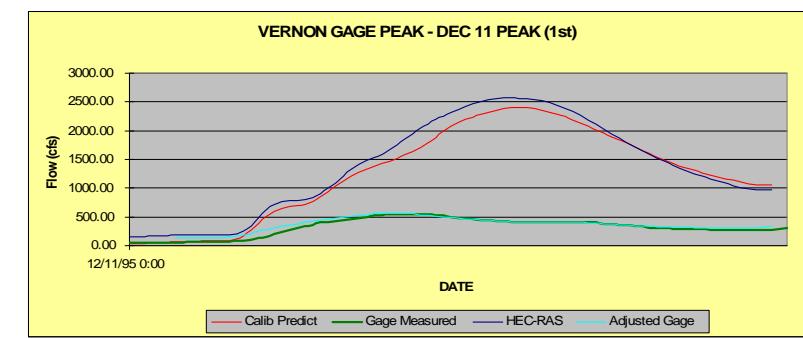
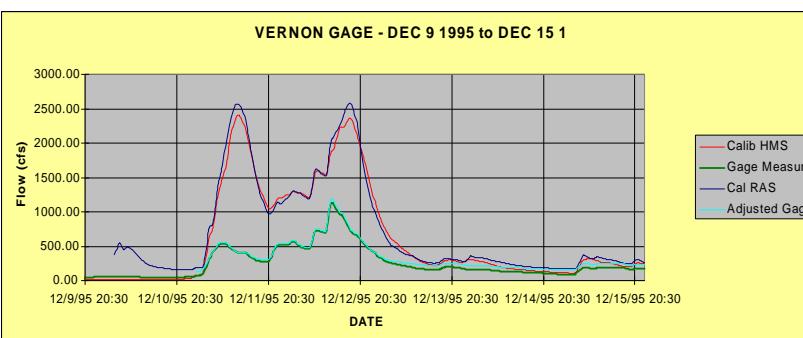
PLATE C.1

# GAGE 1603 VERNON - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

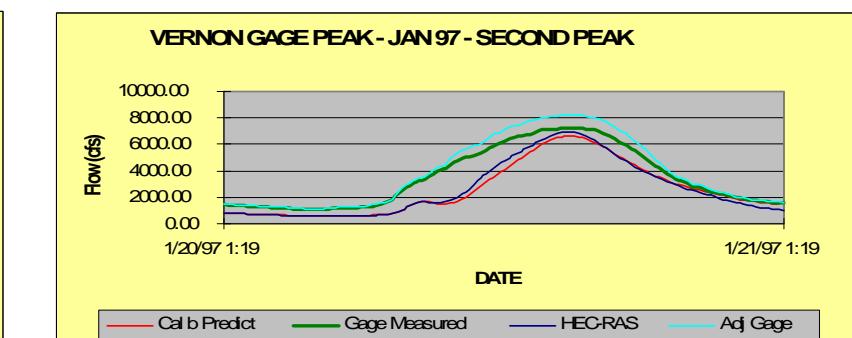
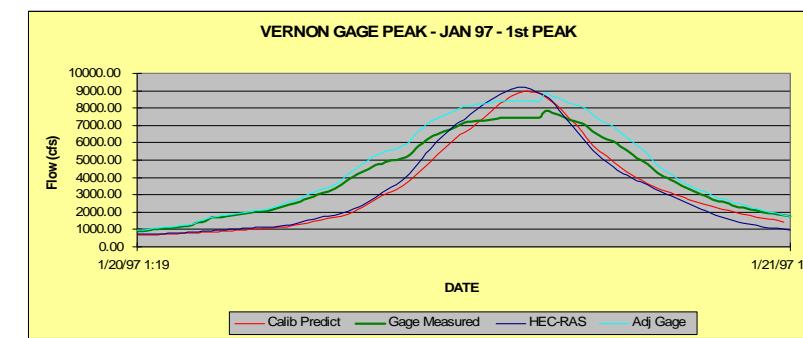
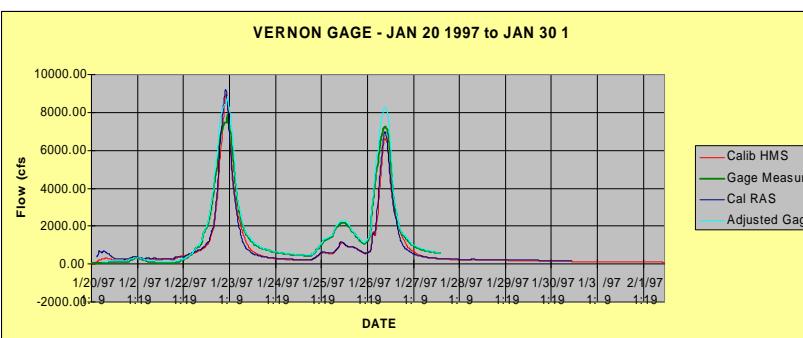
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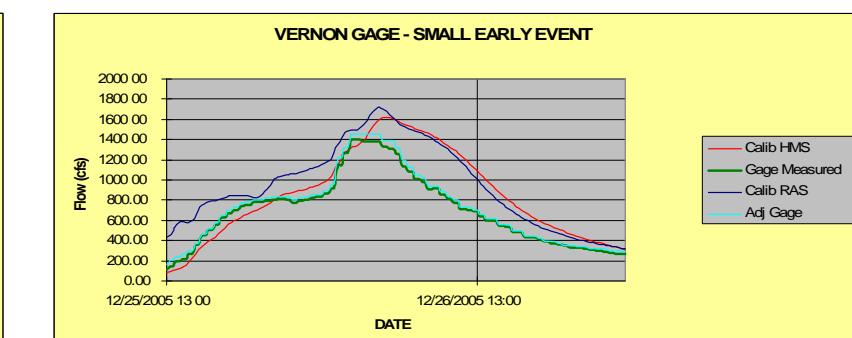
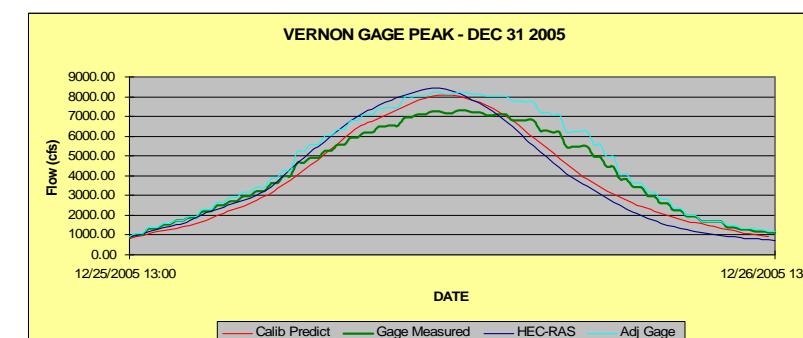
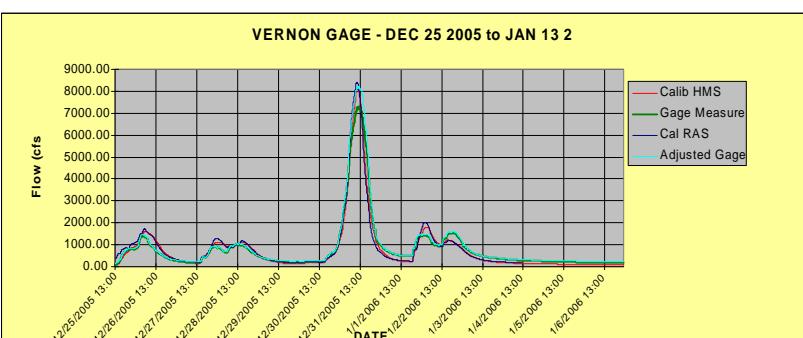
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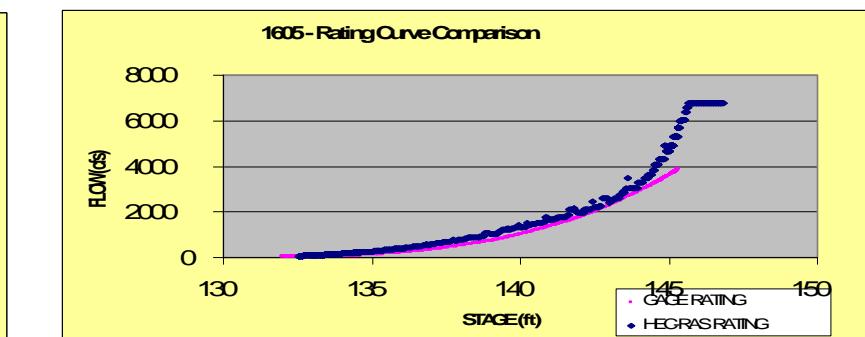
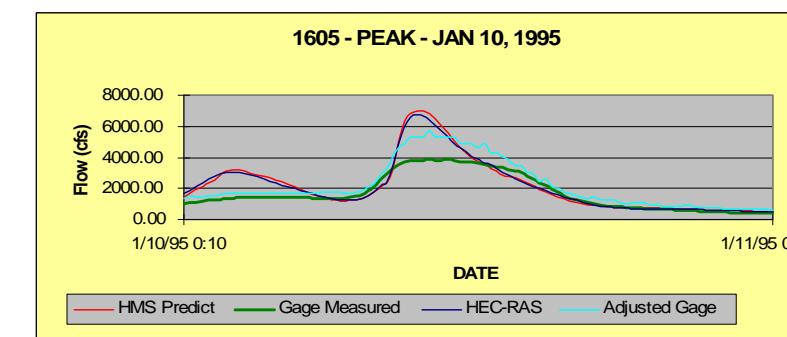
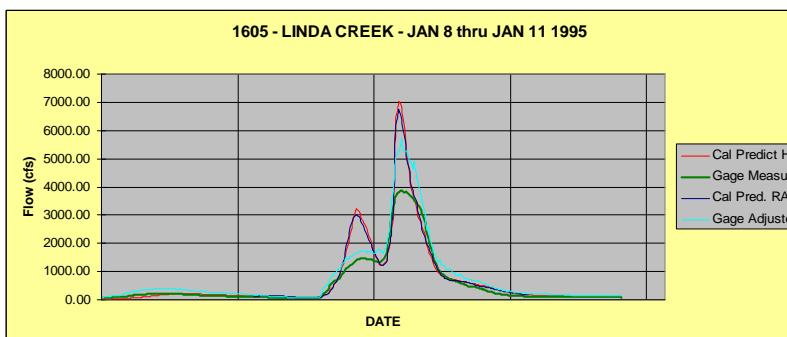


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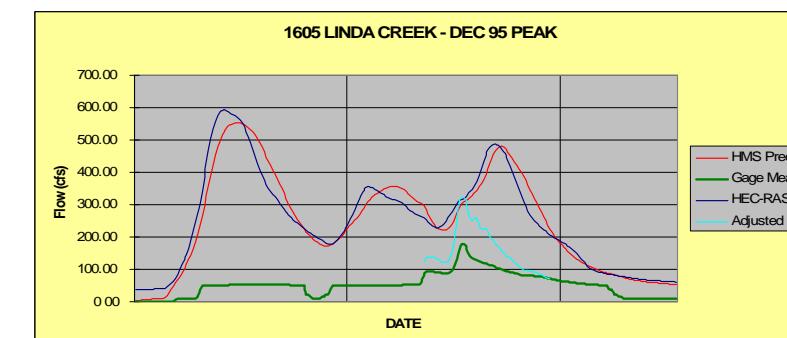
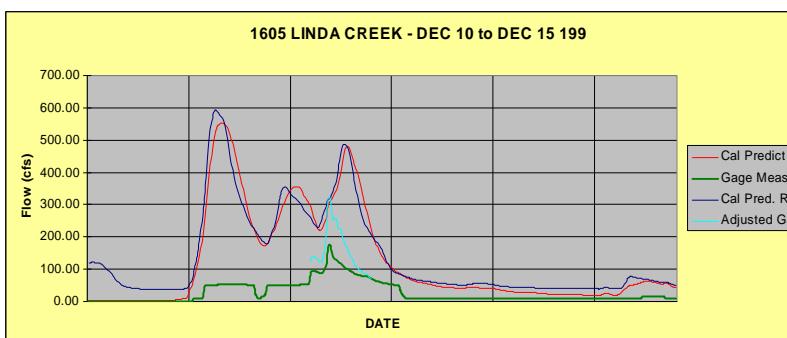


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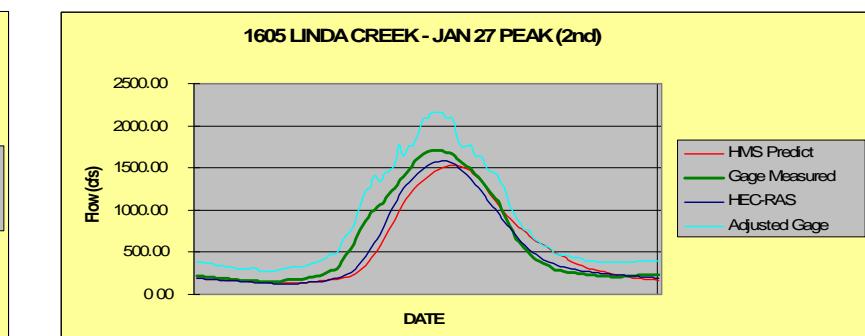
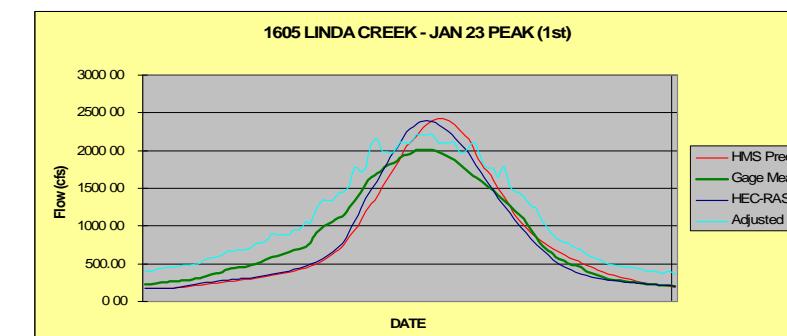
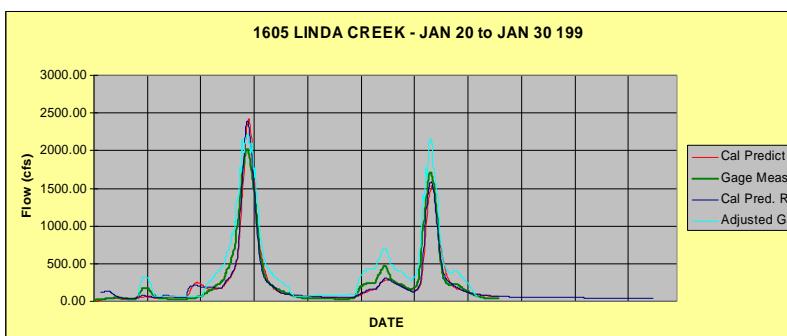
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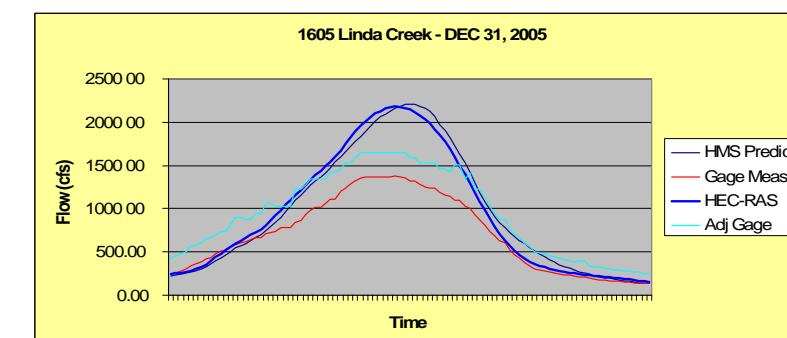
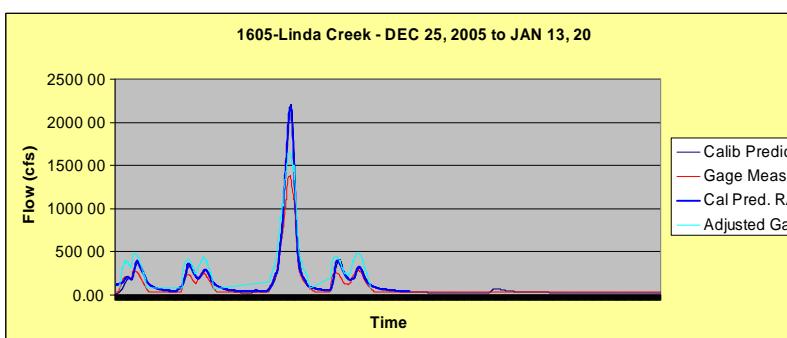
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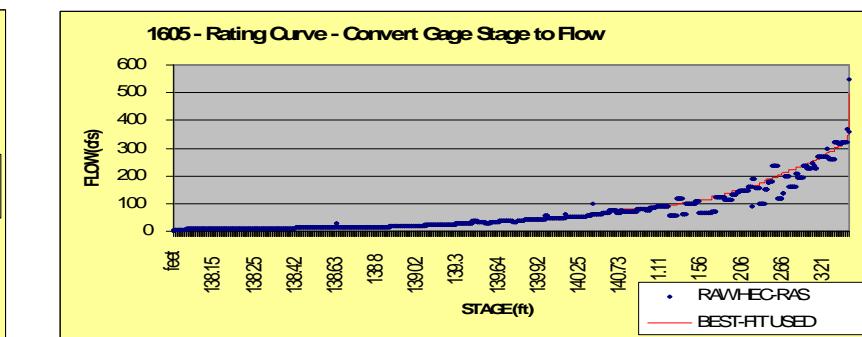
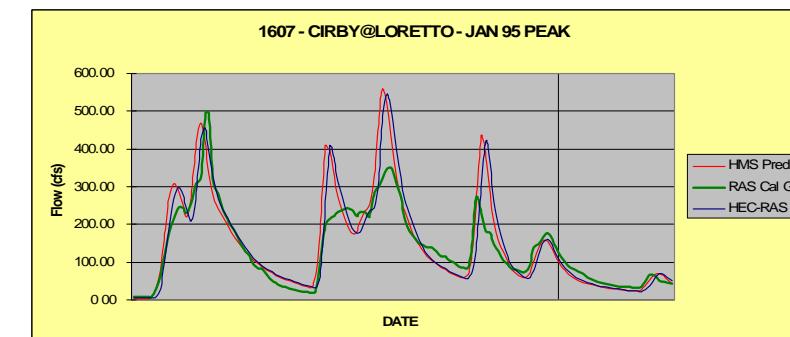
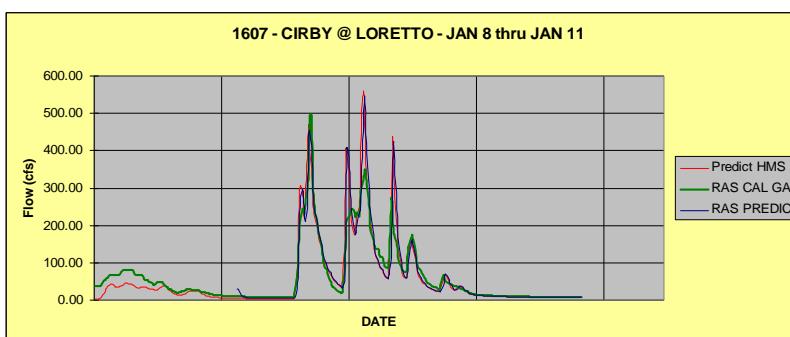


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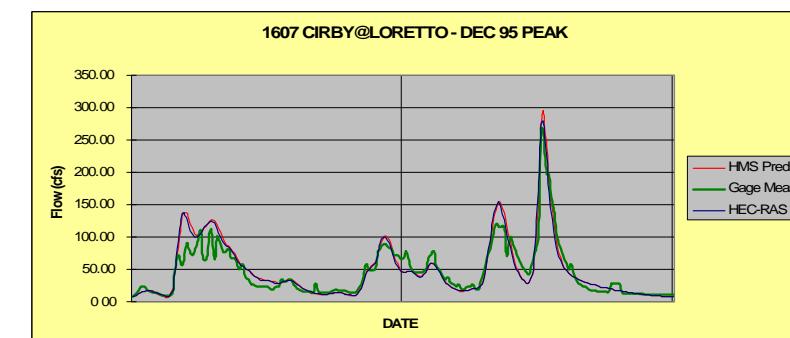
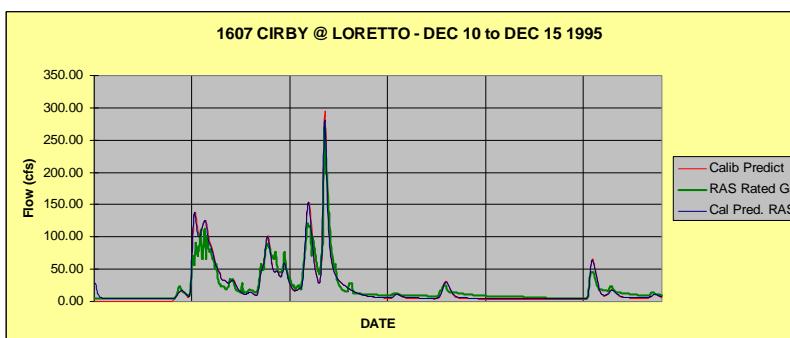


# GAGE 1607 CIRBY/LORETTA - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

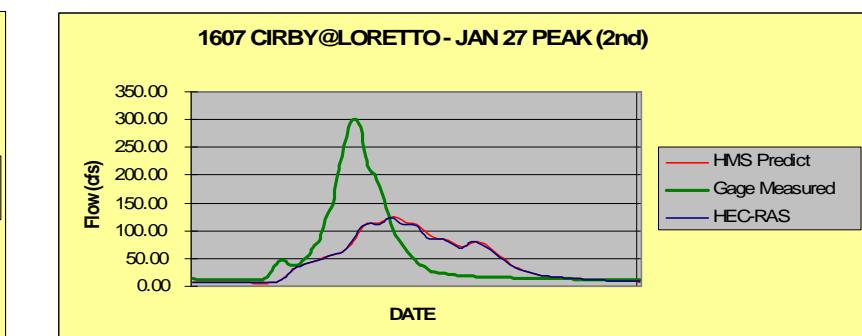
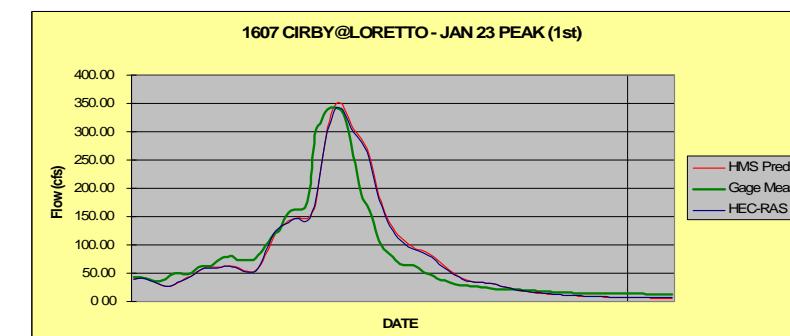
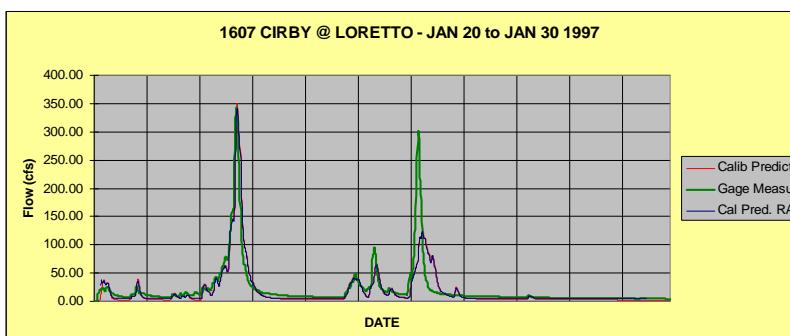
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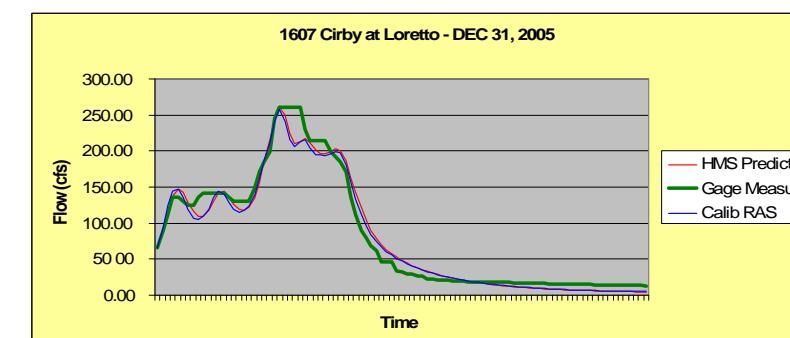
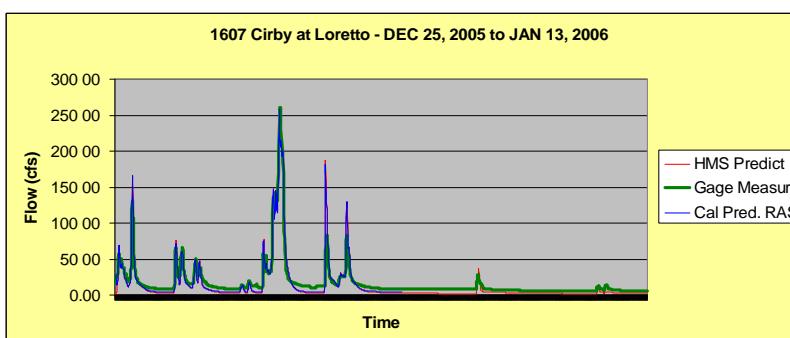
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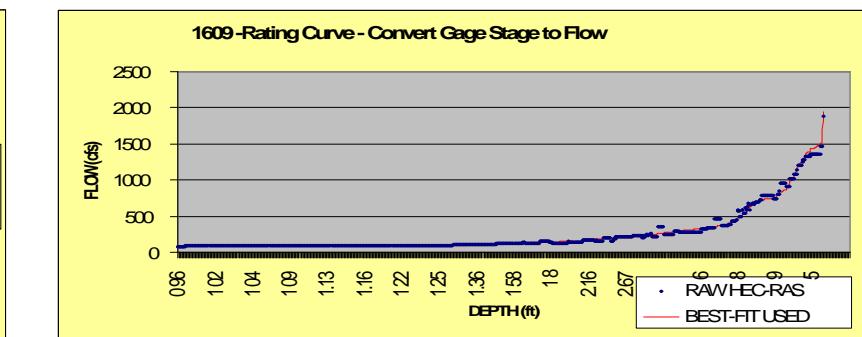
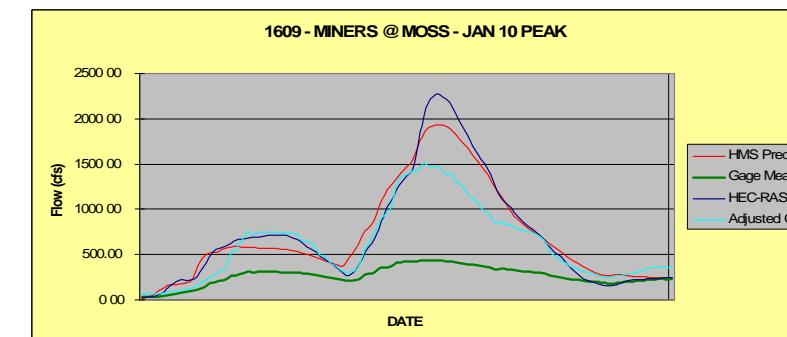
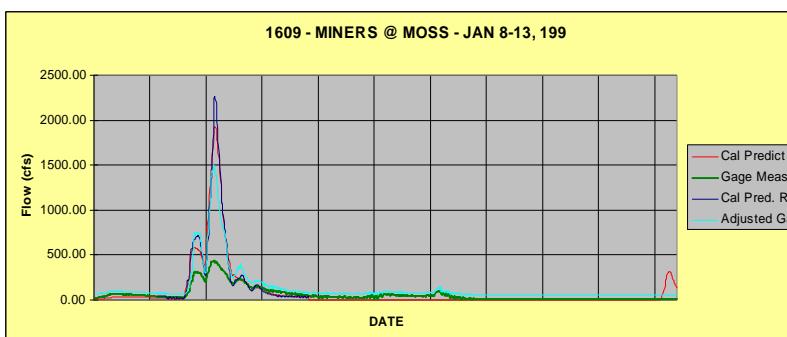


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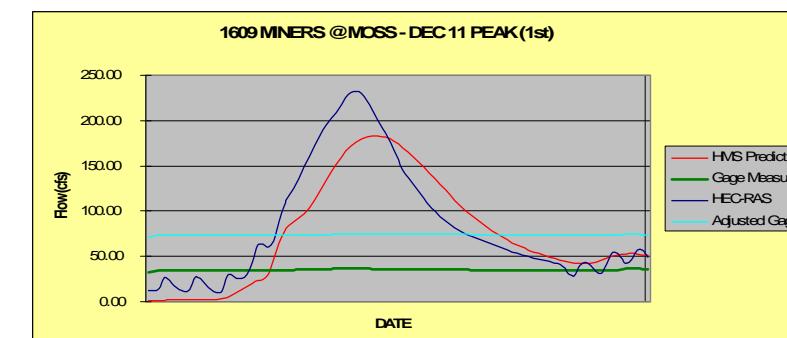
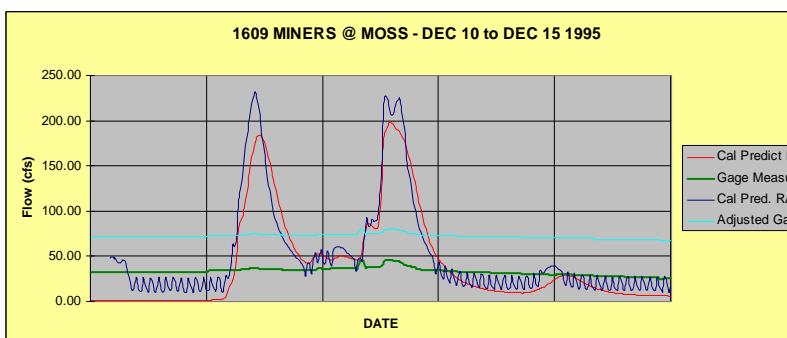


# GAGE 1609 MINERS @ MOSS LN - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

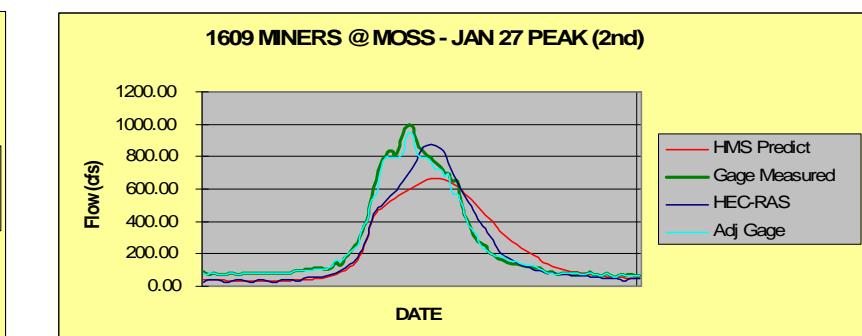
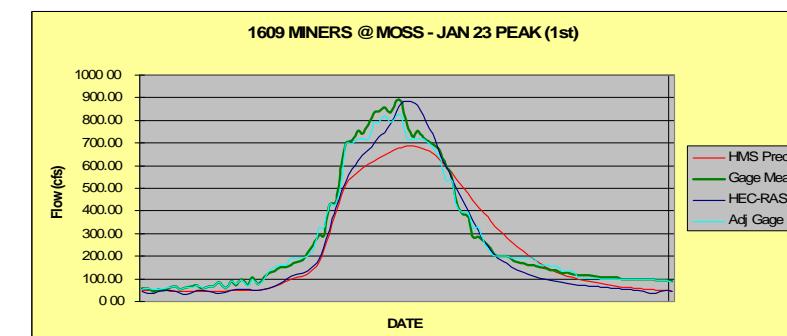
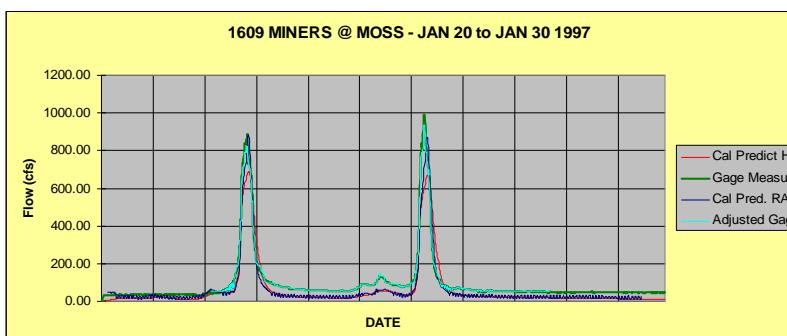
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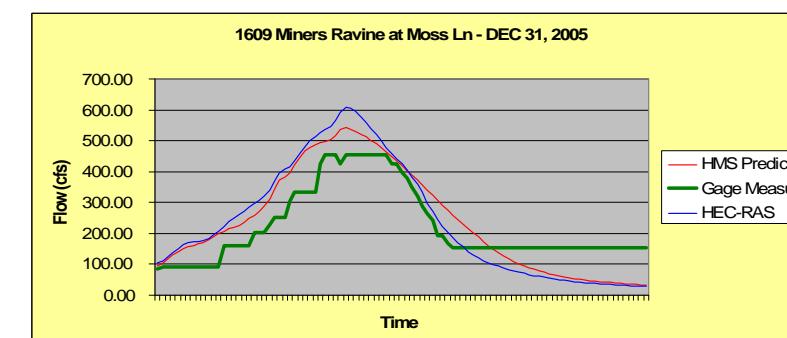
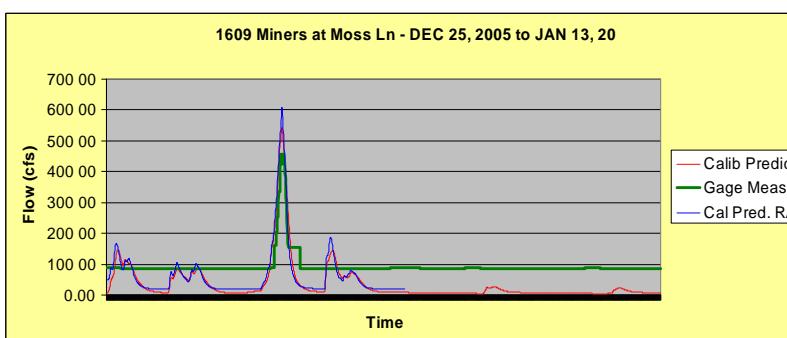
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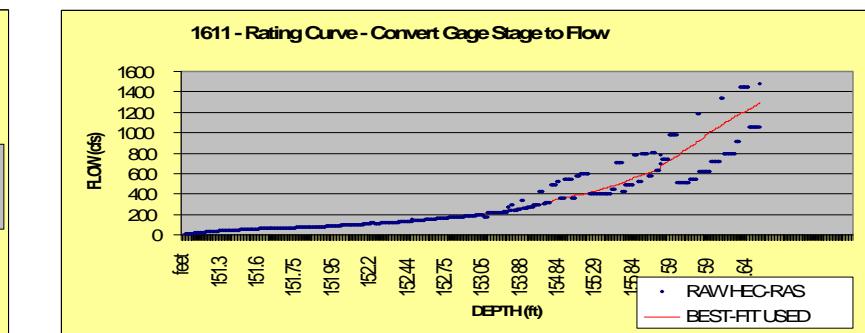
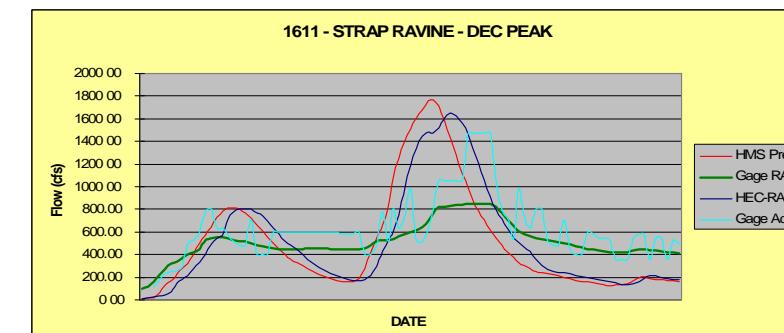
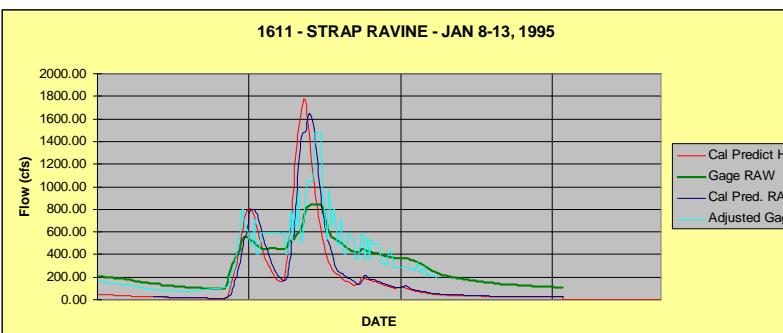


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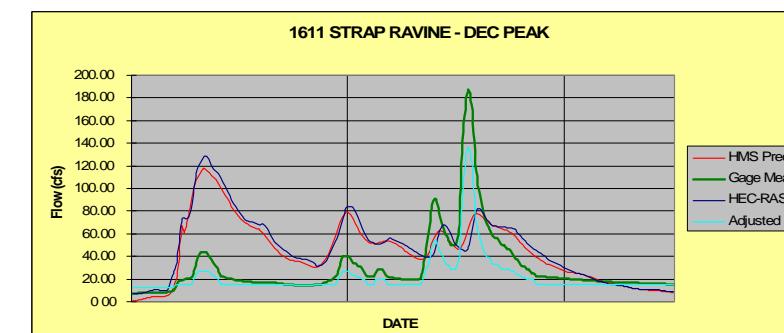
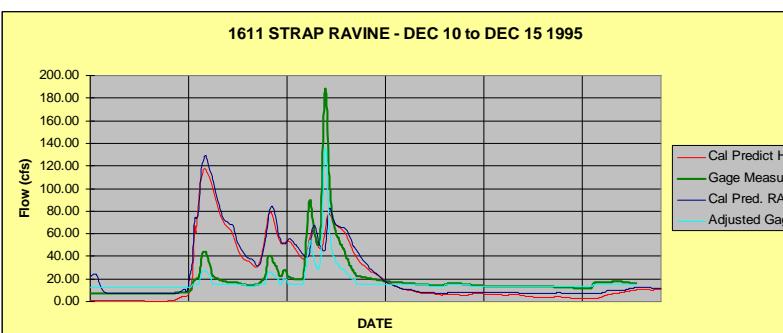


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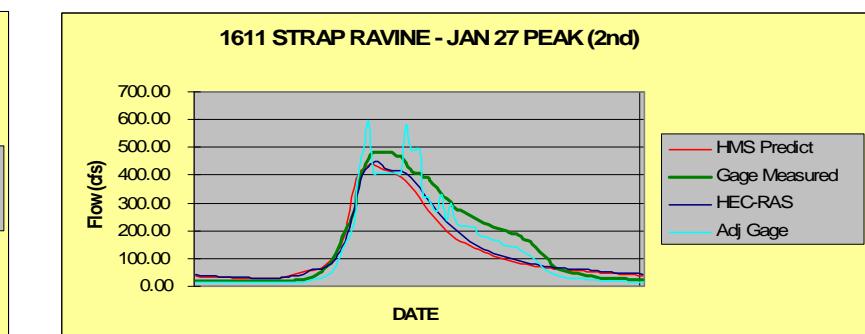
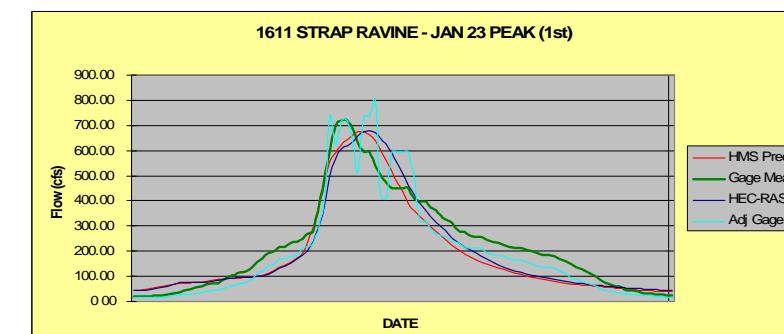
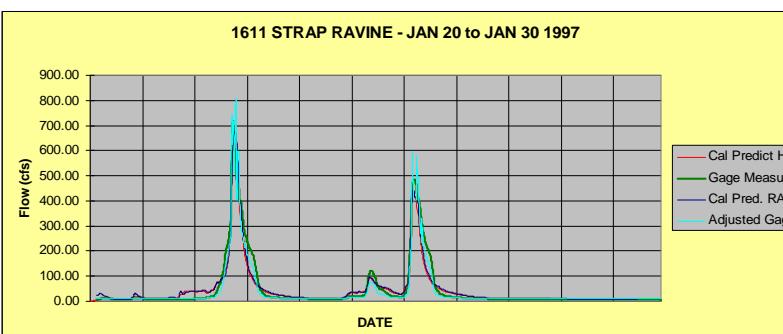
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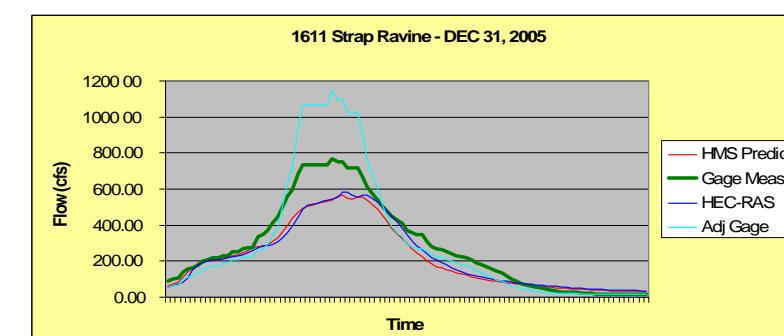
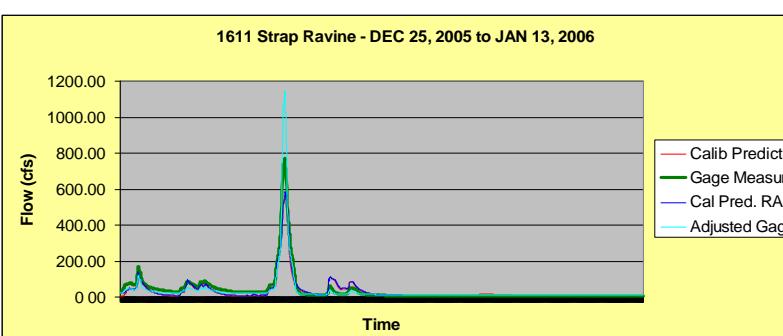
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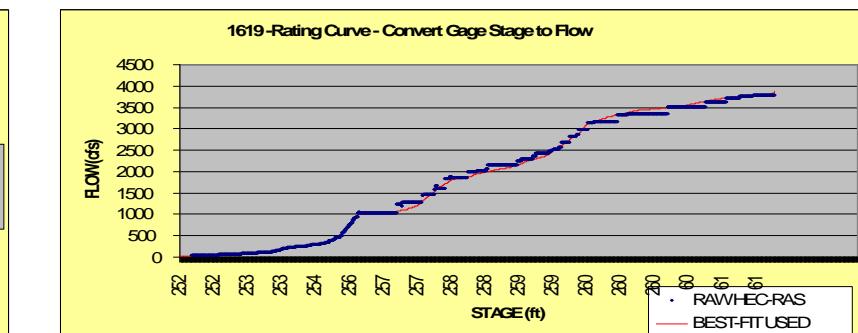
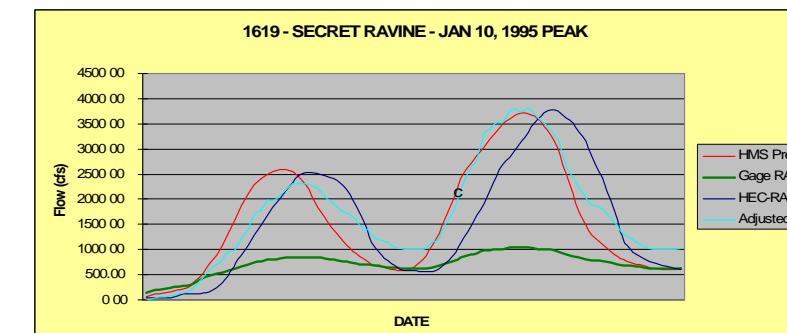
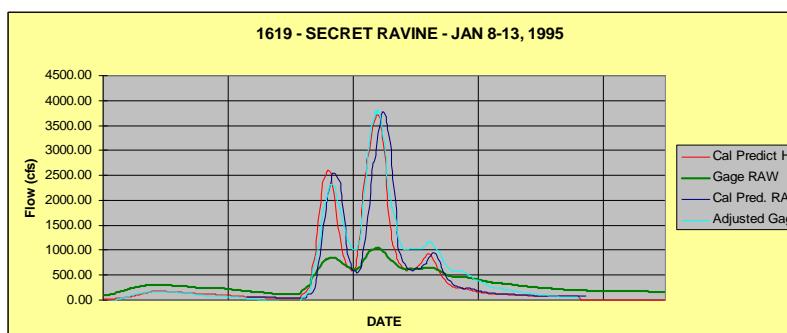


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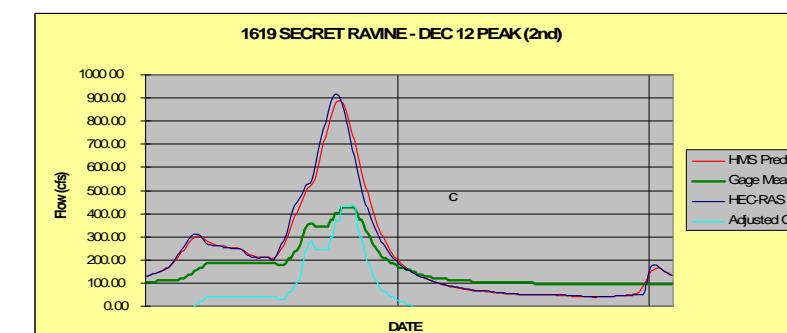
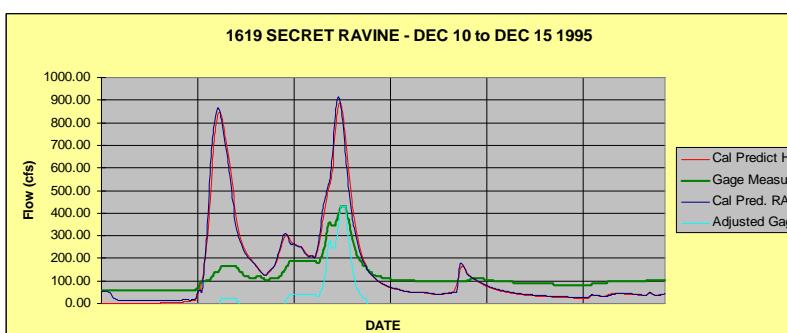


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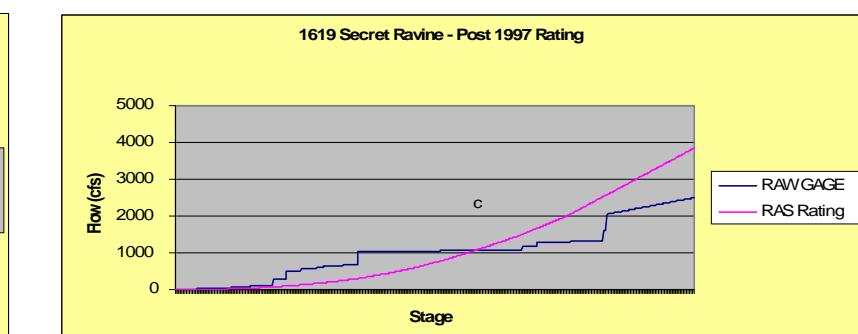
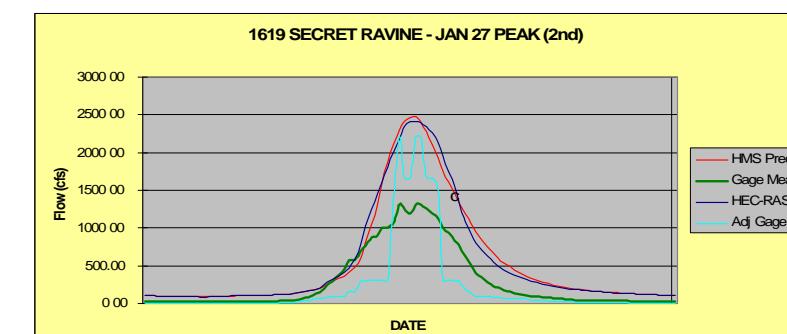
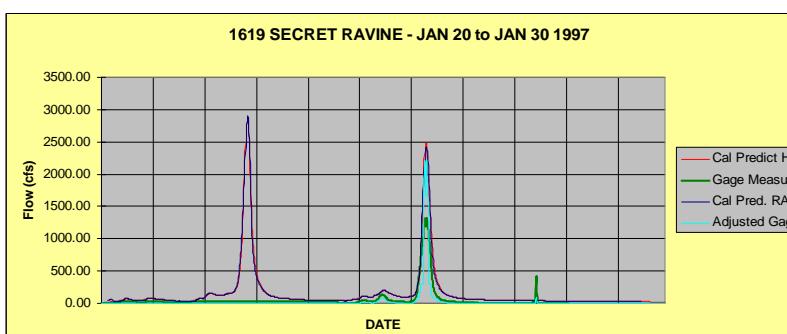
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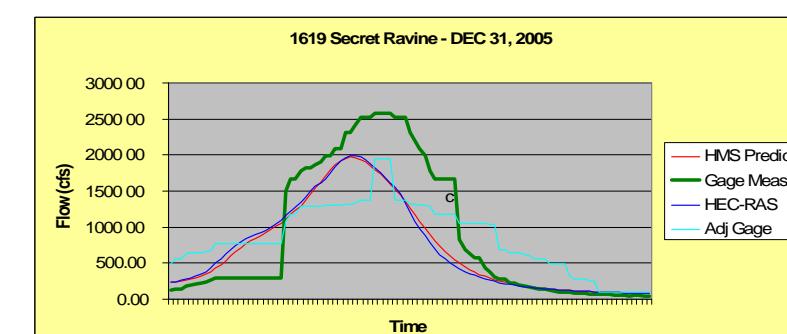
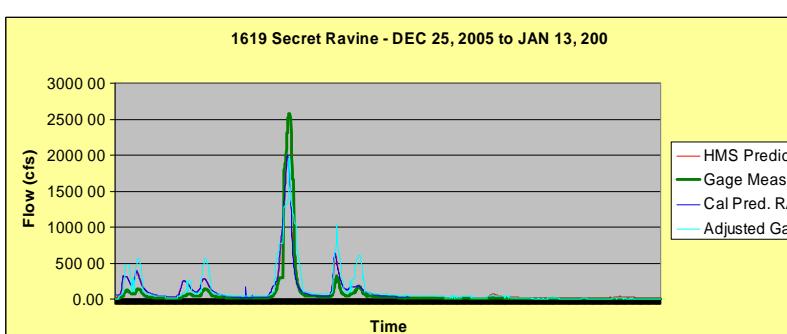
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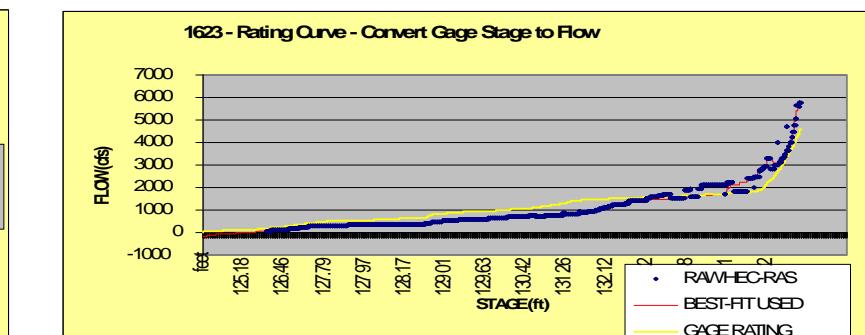
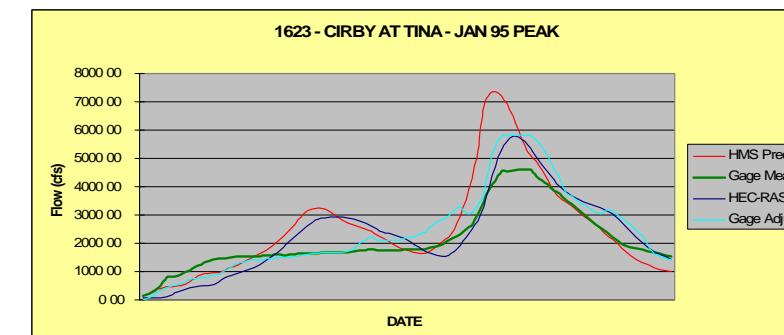
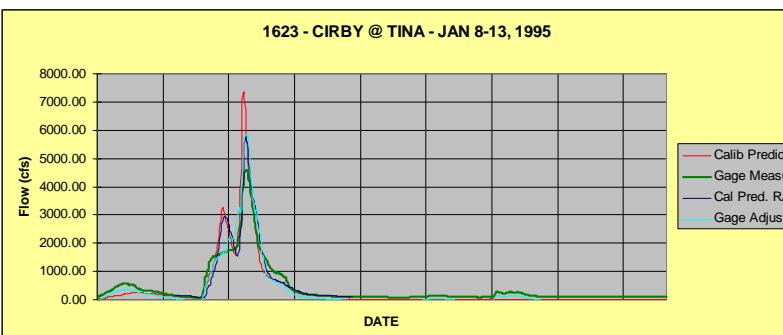


DEC. 2005  
EVENT

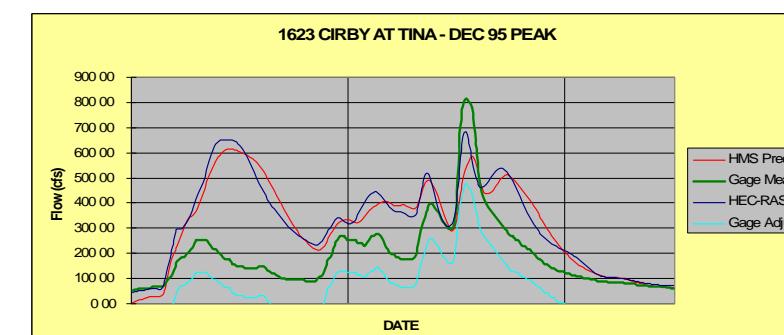


# GAGE 1623 CIRBY @ TINA WAY - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

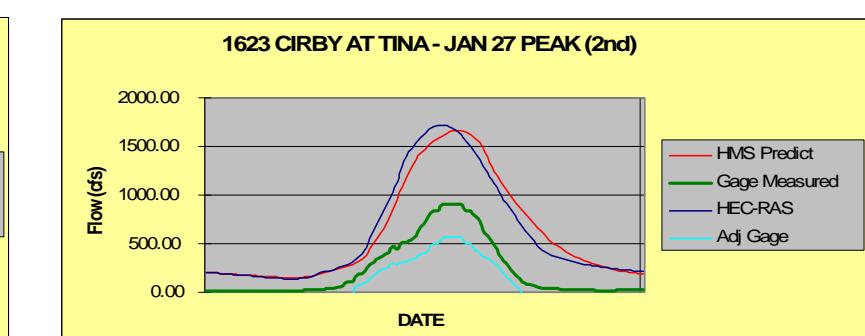
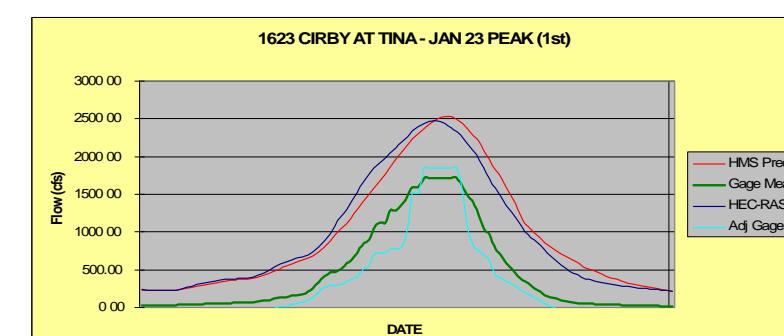
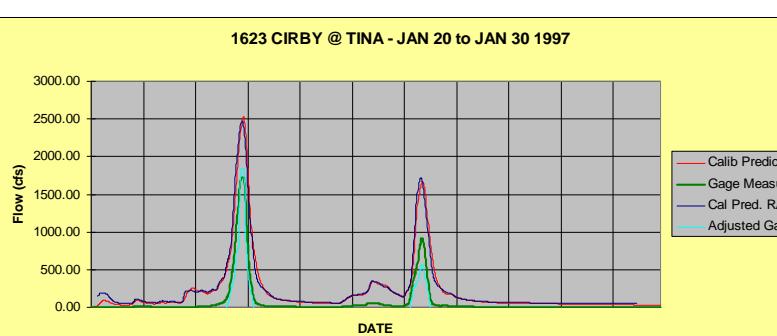
JAN. 1995  
EVENT



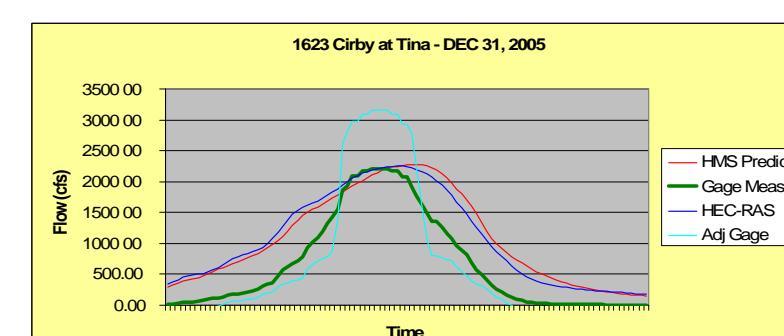
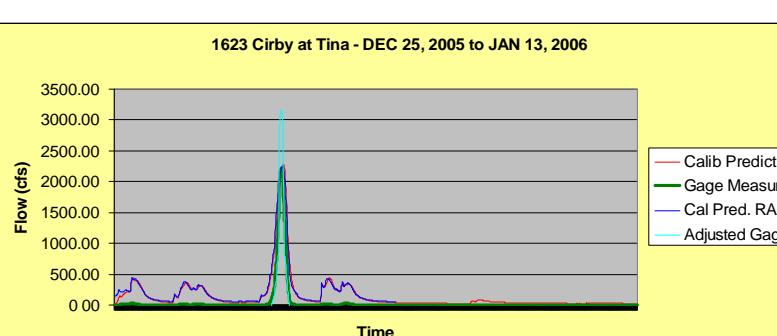
DEC. 1995  
EVENT



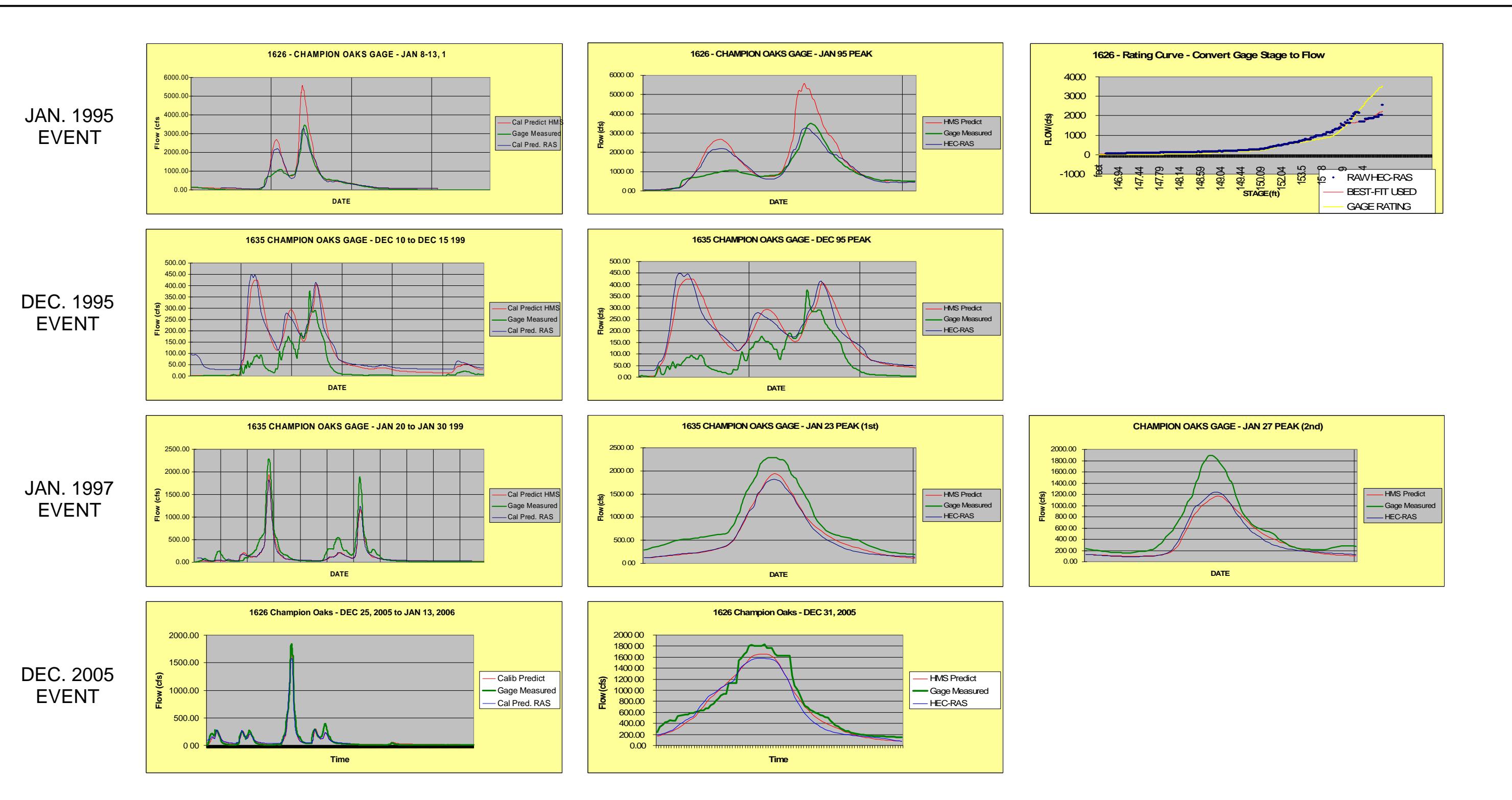
JAN. 1997  
EVENT



DEC. 2005  
EVENT

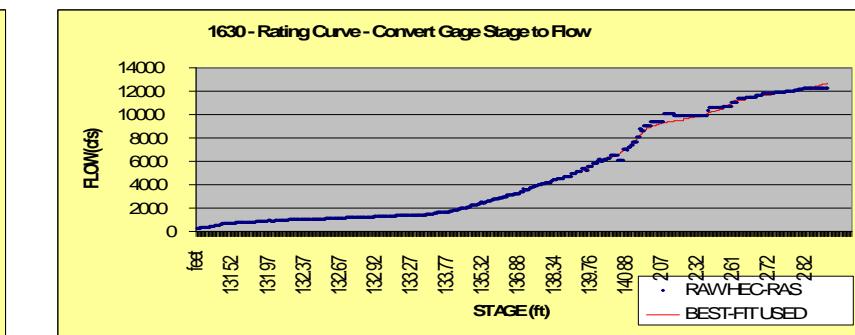
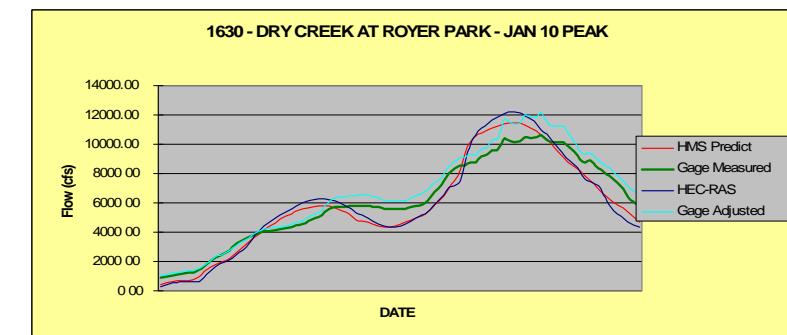
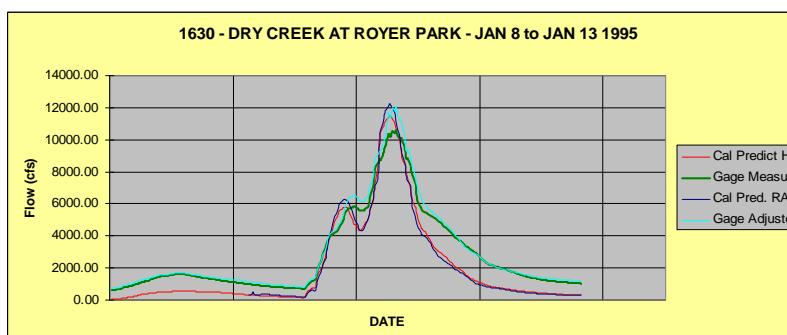


# GAGE 1626 CIRBY @ CHAMPION - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

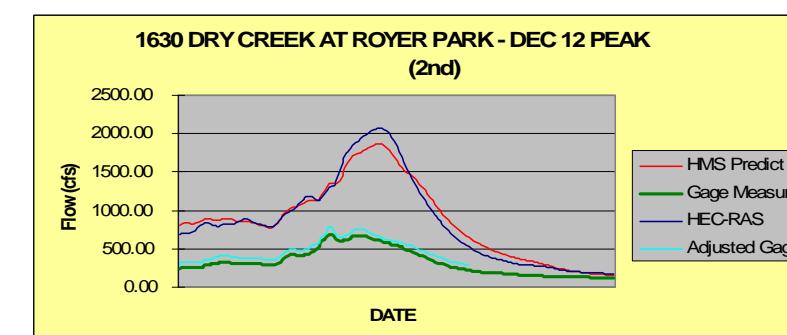
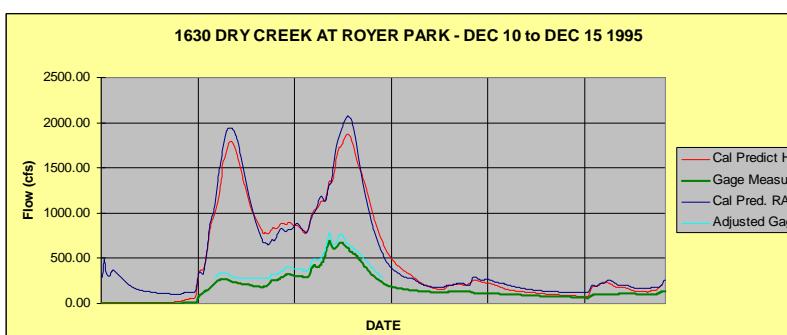


# GAGE 1630 DC @ ROYER - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

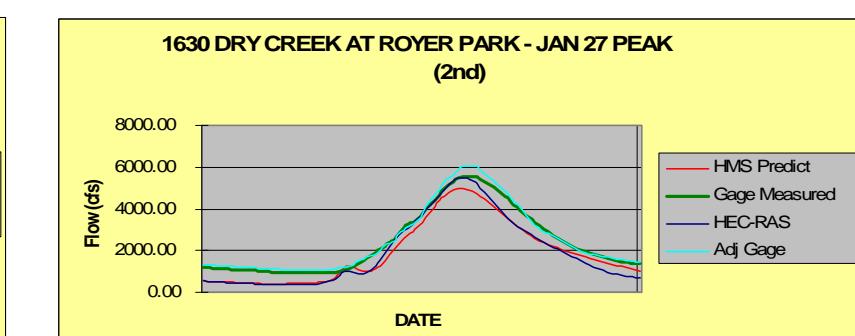
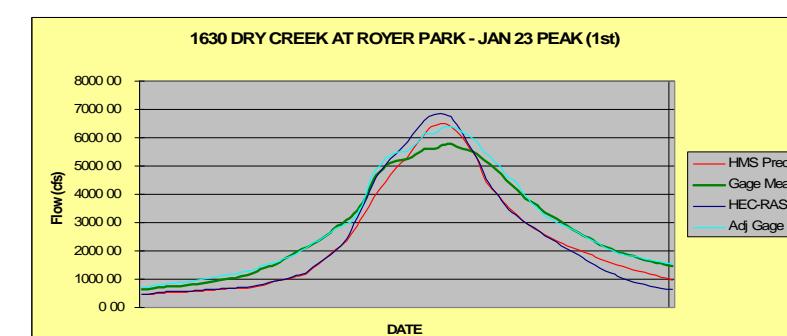
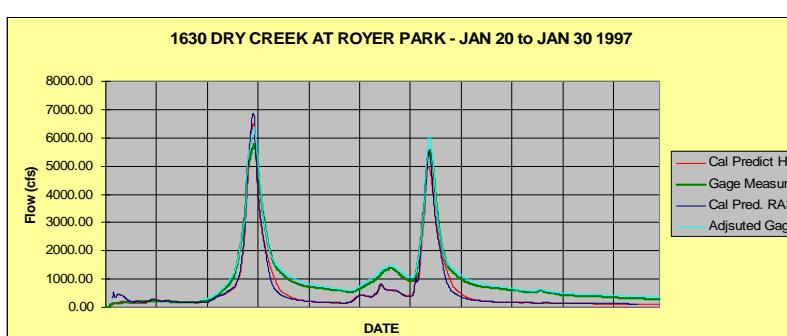
JAN. 1995  
EVENT



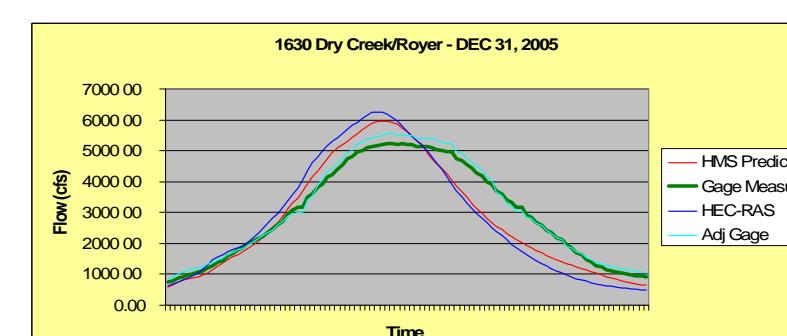
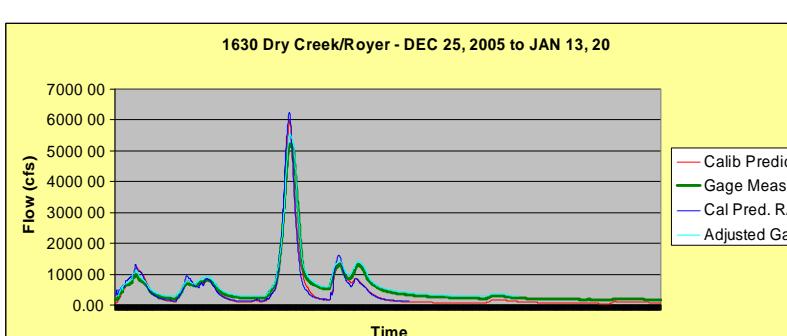
DEC. 1995  
EVENT



JAN. 1997  
EVENT



DEC. 2005  
EVENT



# JANUARY 1995 EVENT RAINFALL BY GAGE

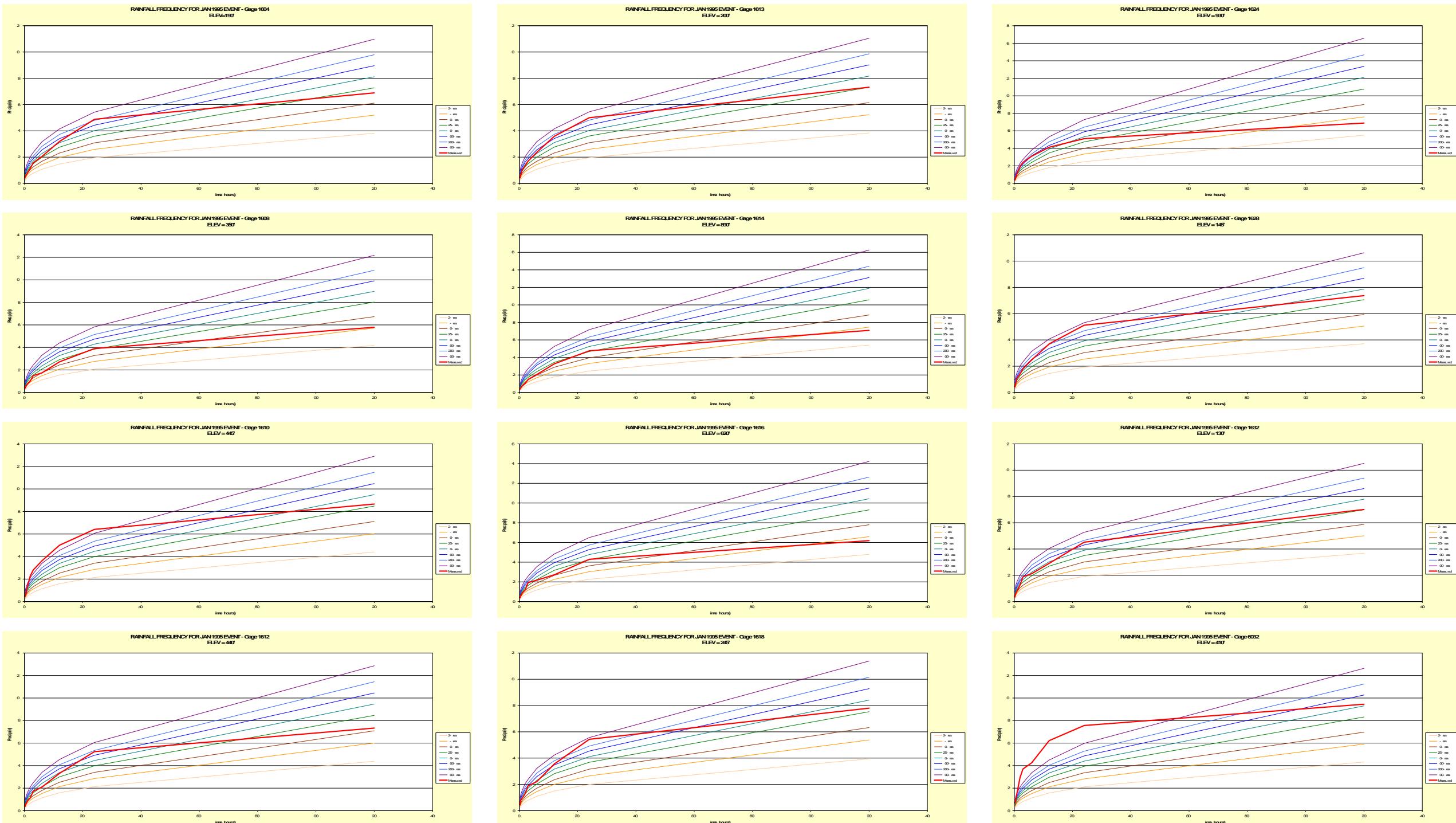


## January 1995 Event

Most Gages reported 200-year recurrence for 6-hour & 24-hour event.  
 Varies between 50-yr and 500-yr precip.  
 24-hour precip varied between: 3.9 7.56  
 50-year at gage: 1608 12-hour precip varied between 2.72 6.22  
 > 500-year at gage: 6032 6-hour precip varied between 1.74 4.25



# JANUARY 1995 EVENT RAINFALL STORM EVENT RATING BY GAGE



## January 1995 Event

Varies between 50-yr and 500-yr precip.

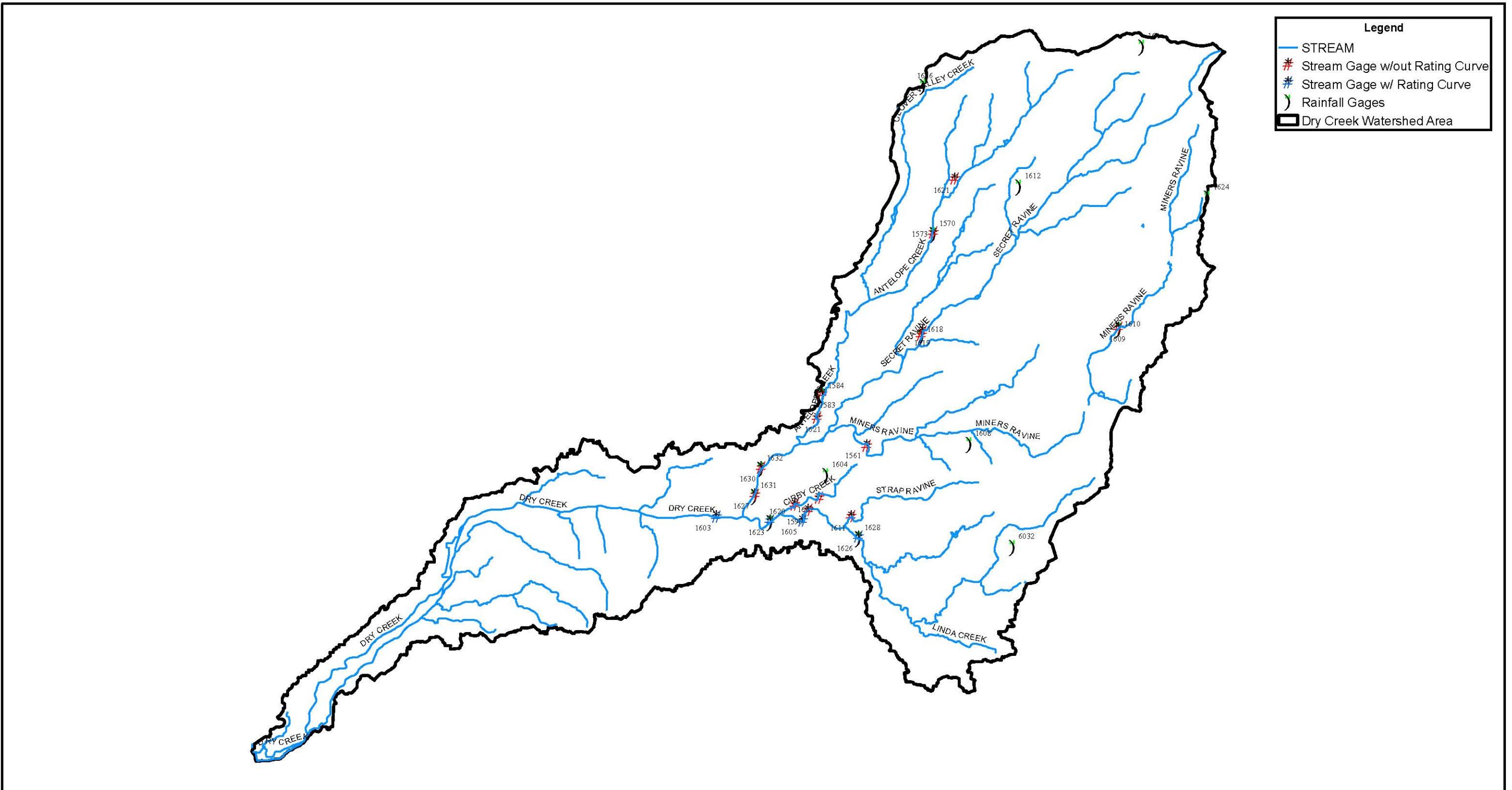
50-year at gage: 1608  
> 500-year at gage: 6032

Most Gages reported 200-year recurrence for 6-hour & 24-hour event.

24-hour precip varied between: 3.9 7.56  
12-hour precip varied between 2.72 6.22  
6-hour precip varied between 1.74 4.25



# DRY CREEK WATERSHED STREAM AND RAINFALL GAGES



PLACER COUNTY FLOOD CONTROL AND WATER  
CONSERVATION DISTRICT

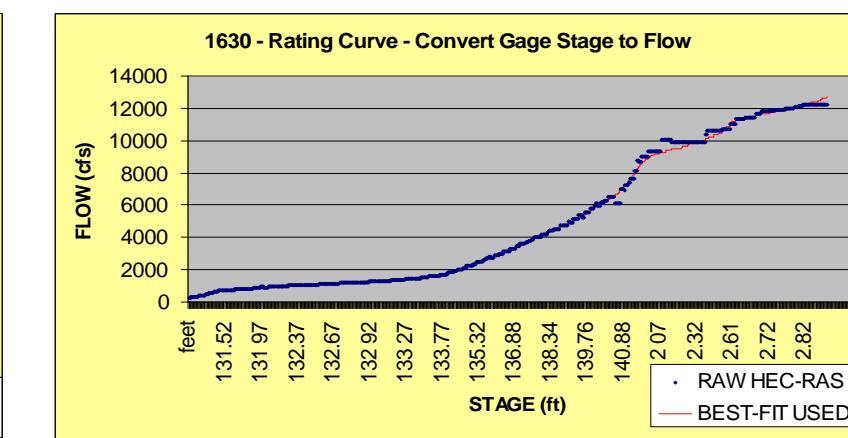
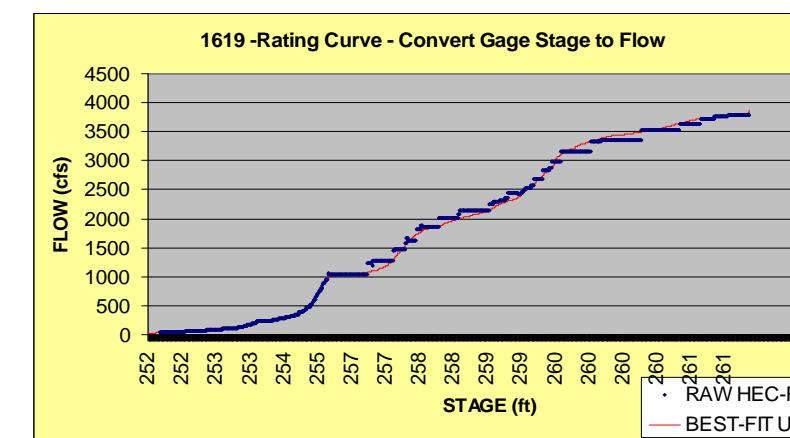
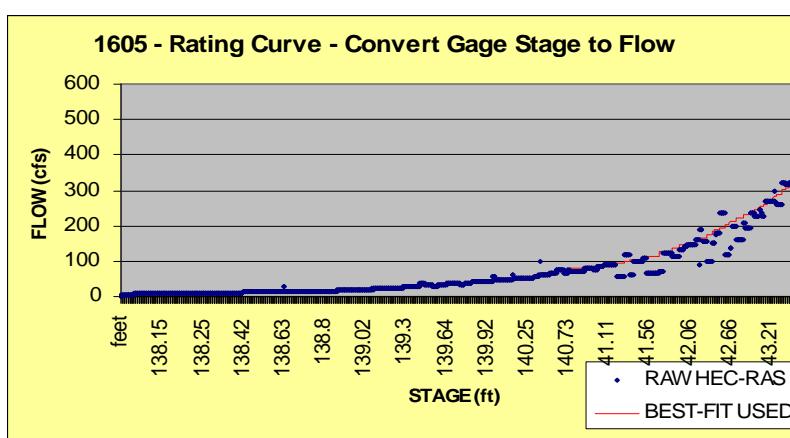
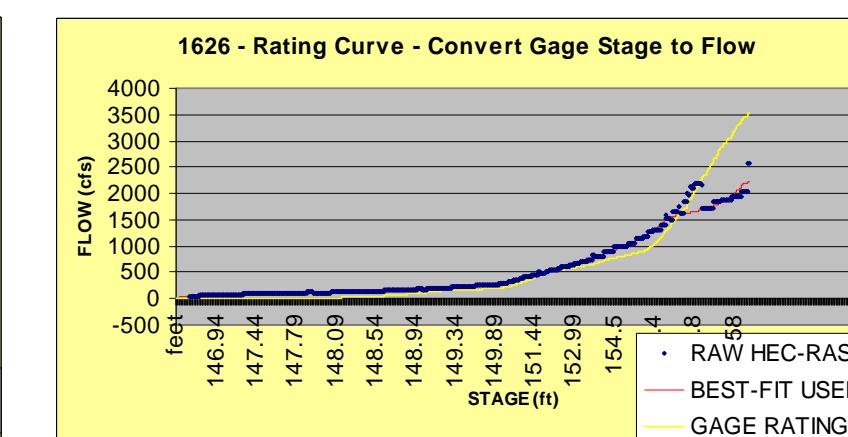
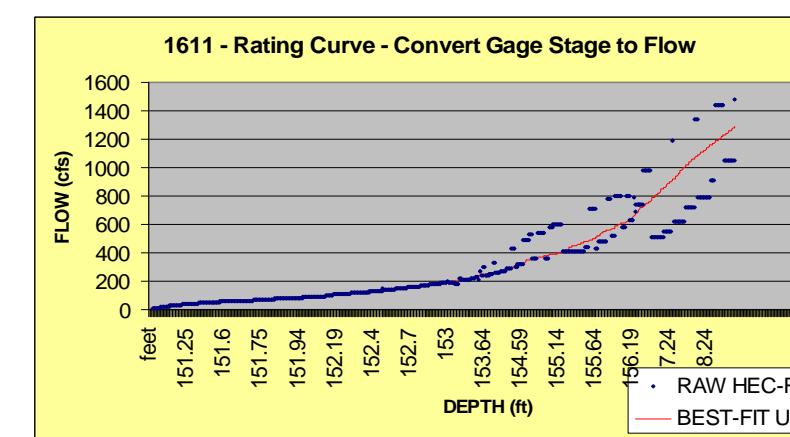
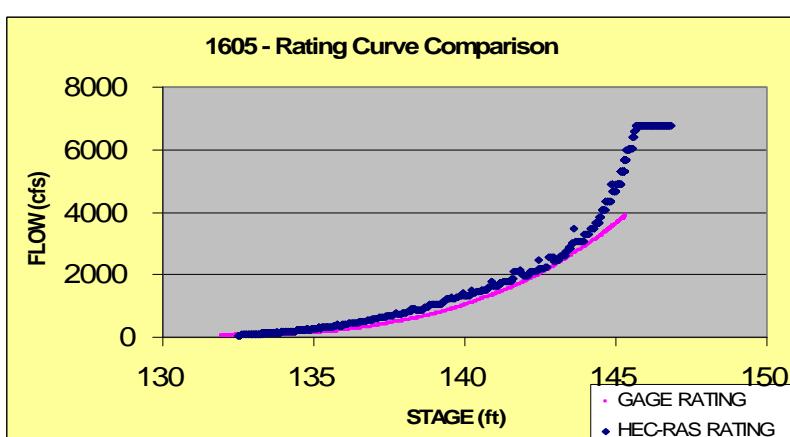
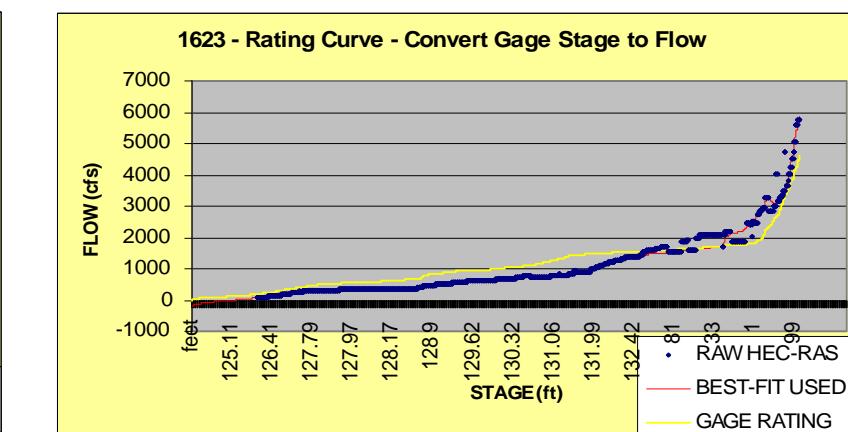
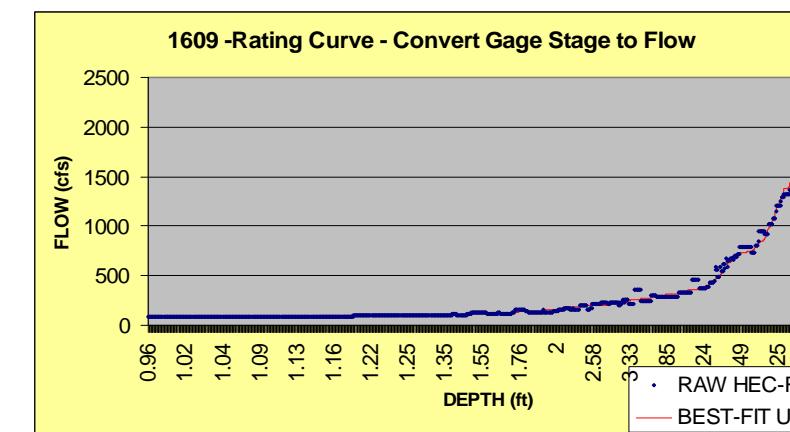
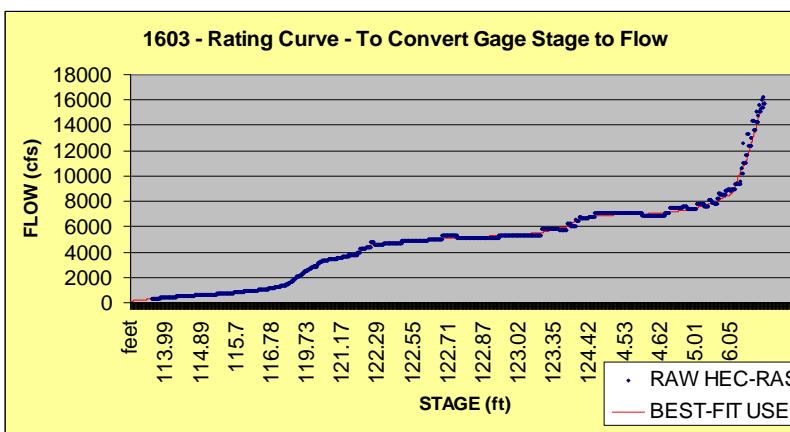


RBF CONSULTING  CIVIL ENGINEERING  
SOLUTIONS, INC.

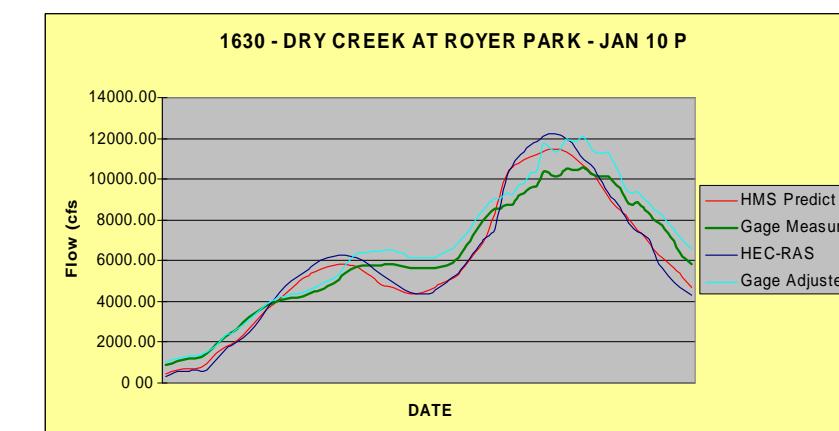
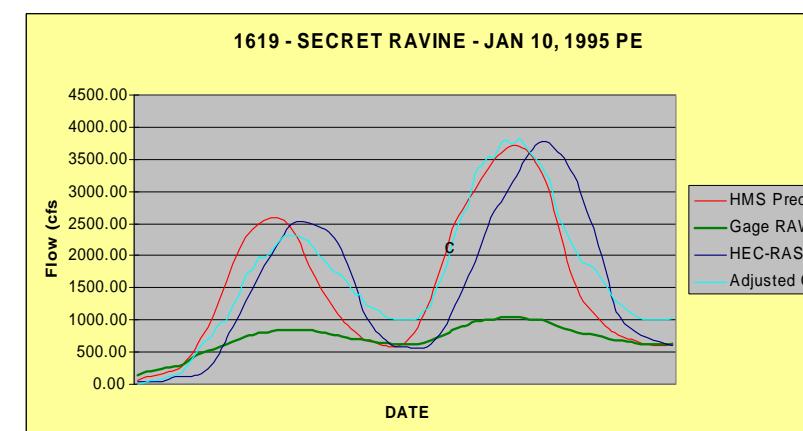
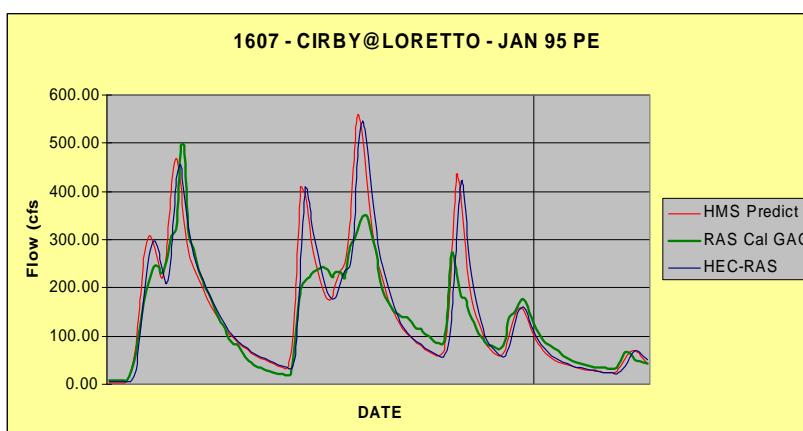
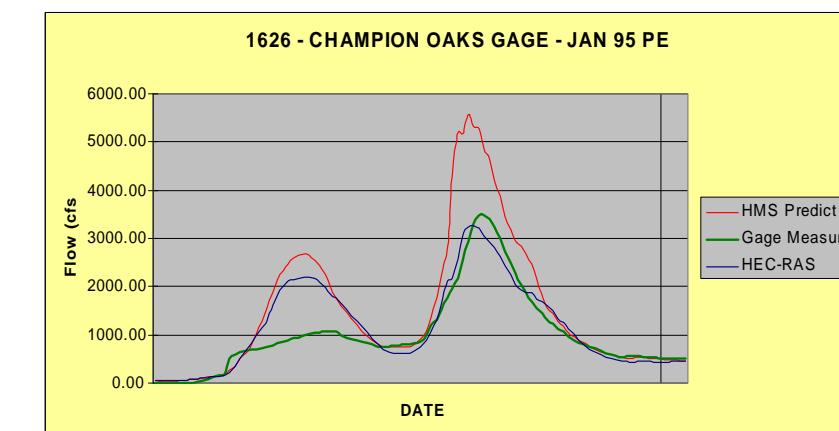
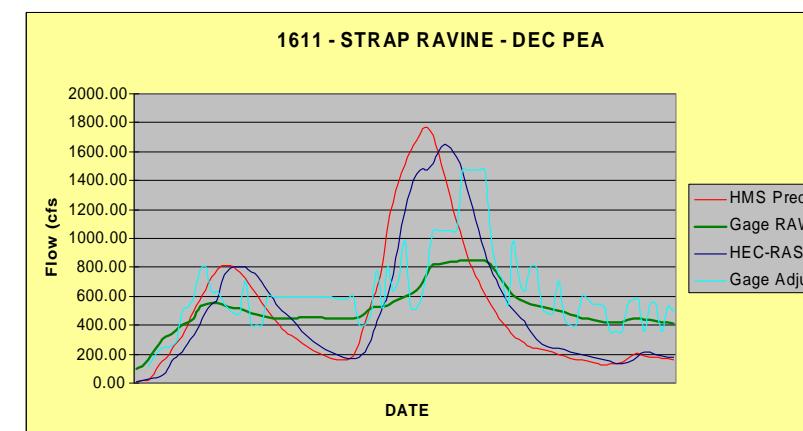
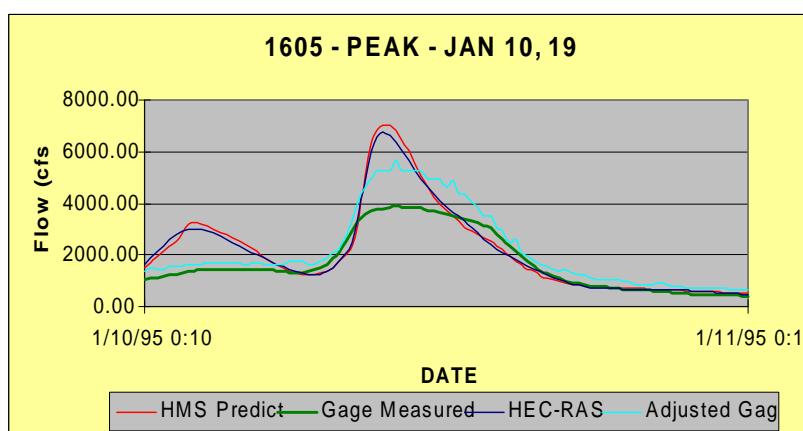
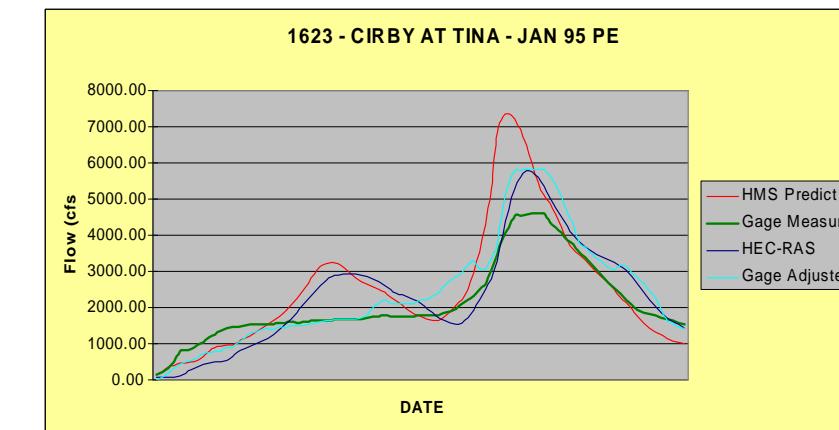
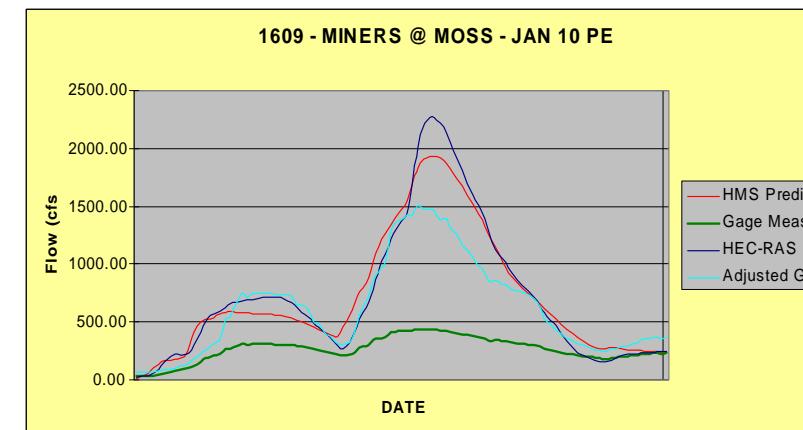
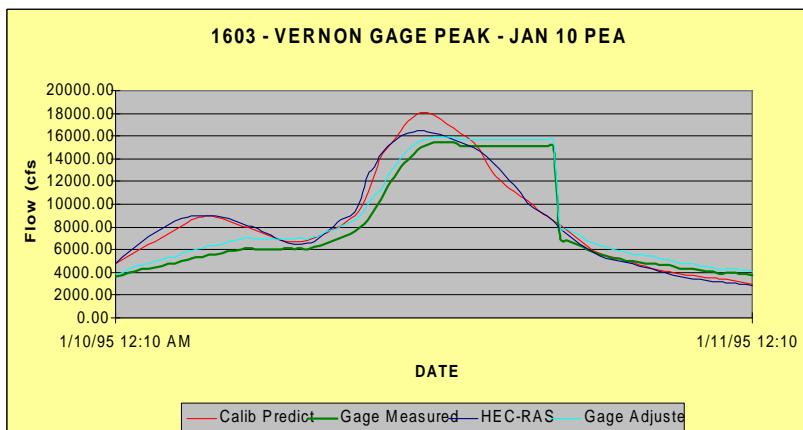
0 1 2 4 Miles  
1 inch = 2 miles

PLATE C.13

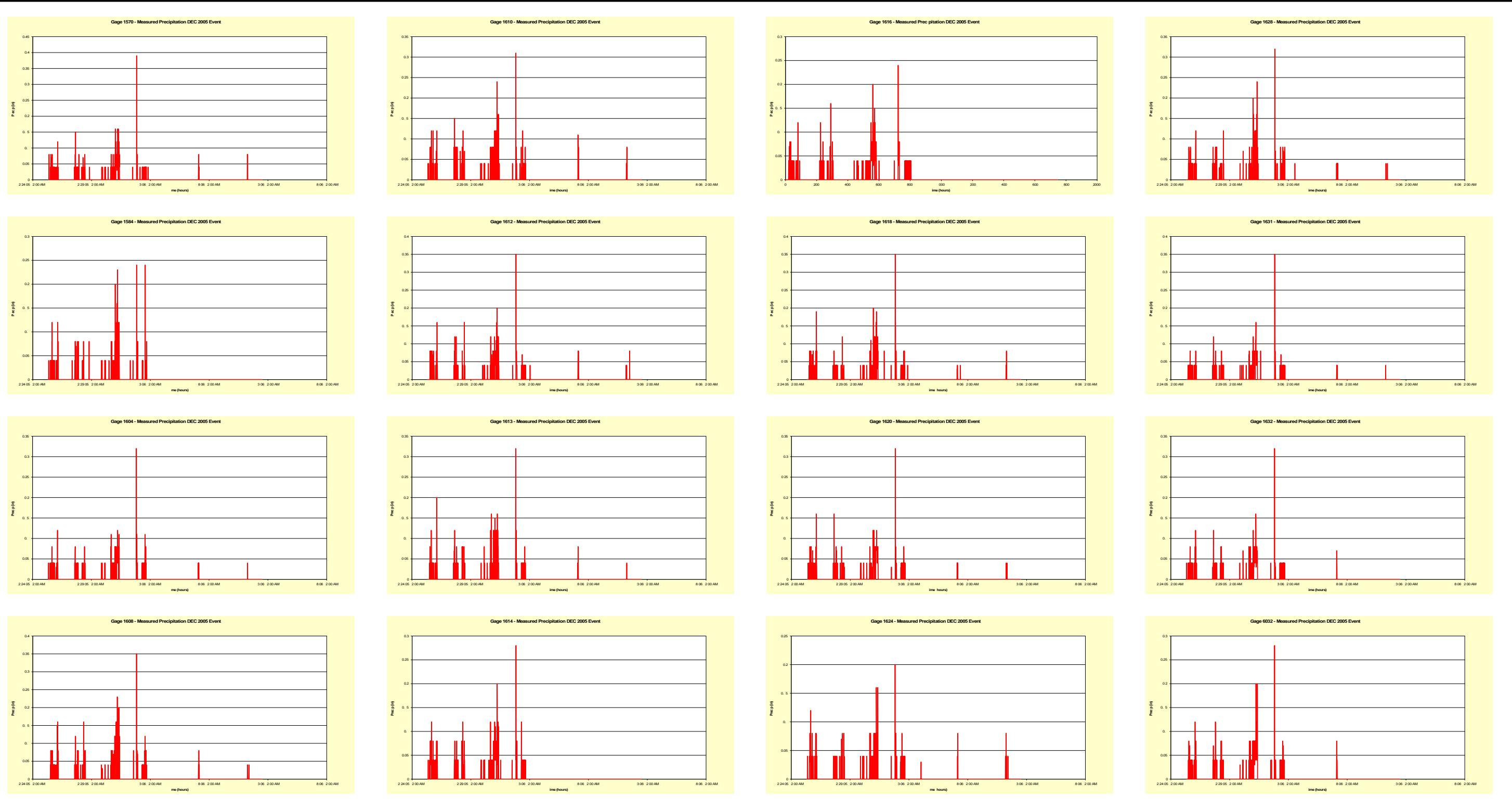
# JANUARY 1995 GAGE / MODEL DEVELOPED RATING CURVES



# JANUARY 1995 PEAK EVENT HYDROGRAPH - GAGE VS CALIBRATED MODEL



# DECEMBER 1995 EVENT RAINFALL BY GAGE



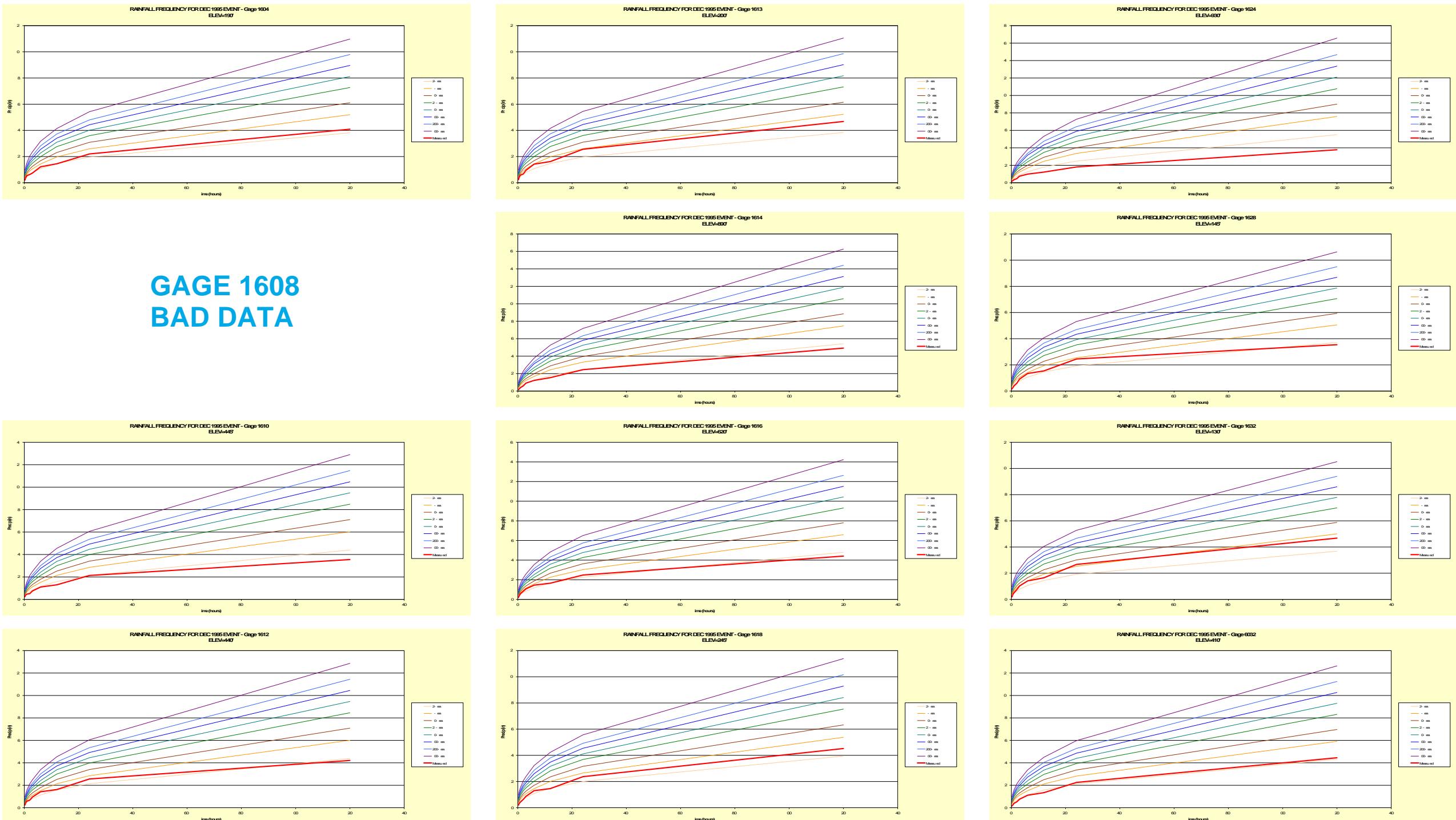
December 31, 2005 event

**Most Gages reported 10-year recurrence for 12 hour event.**

Varies between 2-yr and 50-yr precip. 24-hour precip varied between: 2.55 3.82  
2-year at gage: 1624 12-hour precip varied between 2.12 3.3  
50-year at gage: 6032 6-hour precip varied between 1.26 2.16



# DECEMBER 1995 RAINFALL STORM EVENT RATING CURVE BY GAGE



December 1995 event

Varies between 2-yr and 5-yr precip.

2-year at gage: 1614

5-year at gage: 1632

Most Gages reported 2-year recurrence for 24 hour event.

24-hour precip varied between:

1.81 2.67

12-hour precip varied between:

1.22 1.65

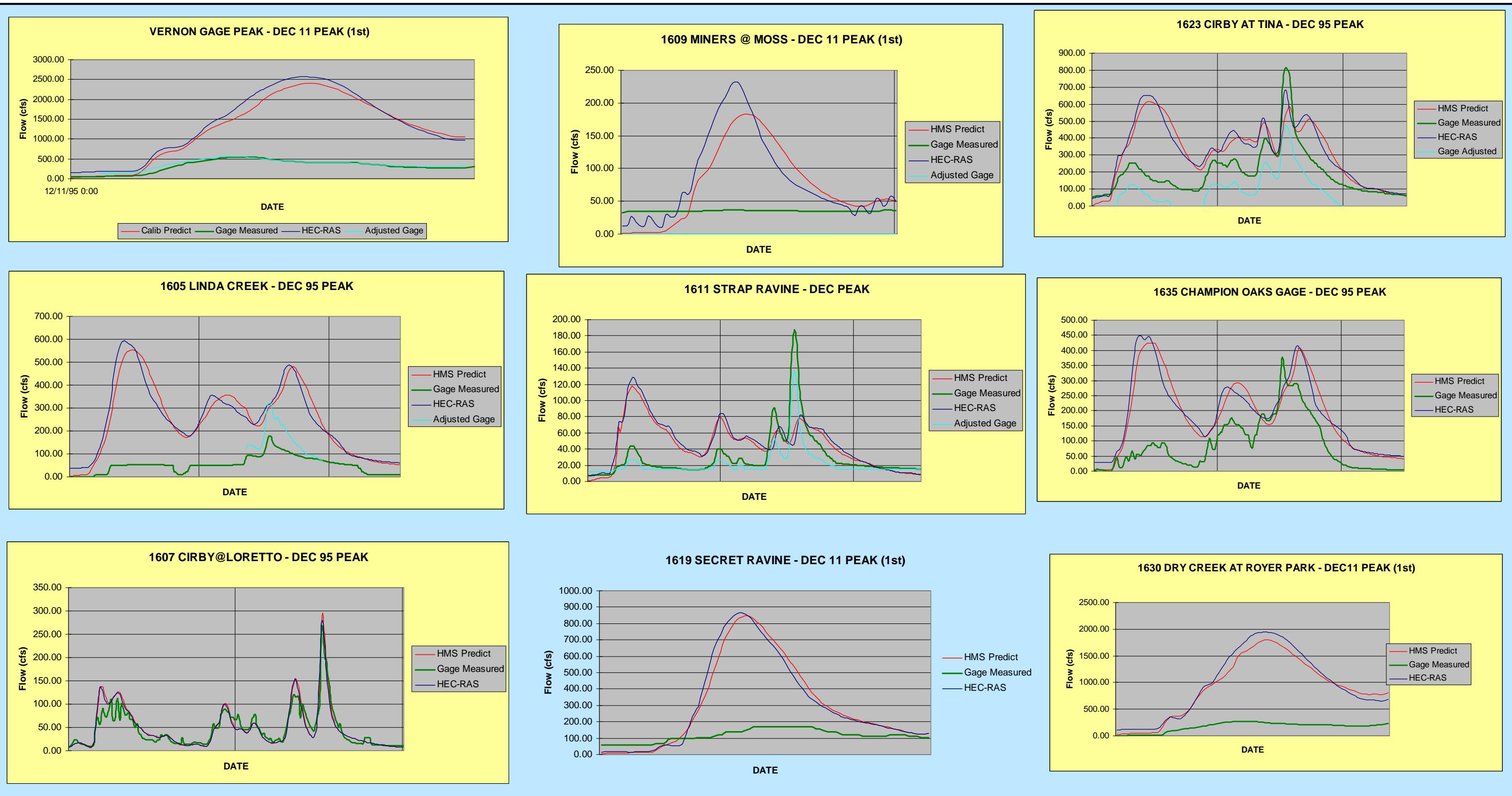
6-hour precip varied between

0.99 1.45



PLATE C.17

# DEC. 1995 -PEAK EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL

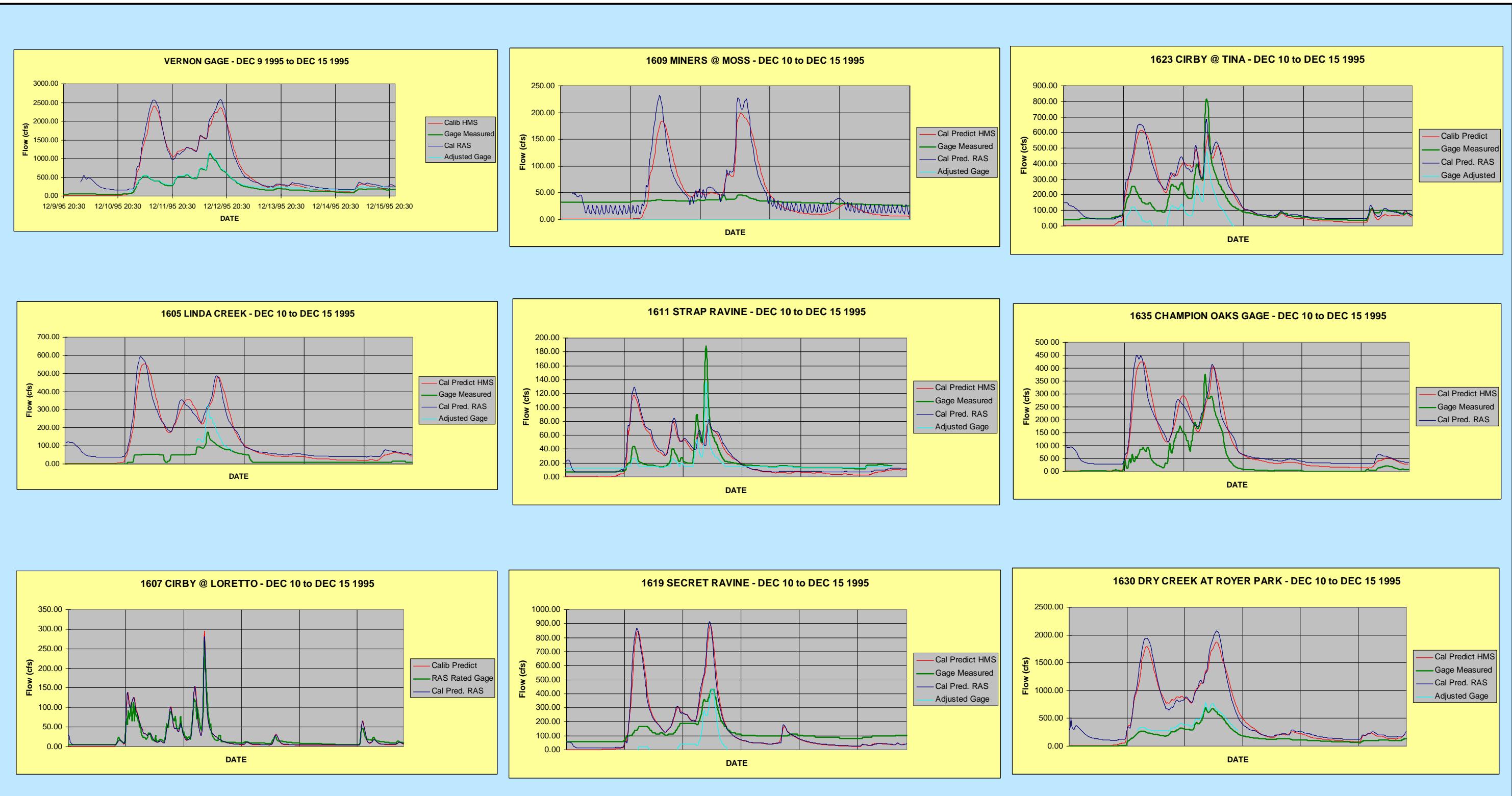


UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN



PLATE  
C-18

# DEC. 1995 - WHOLE EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL

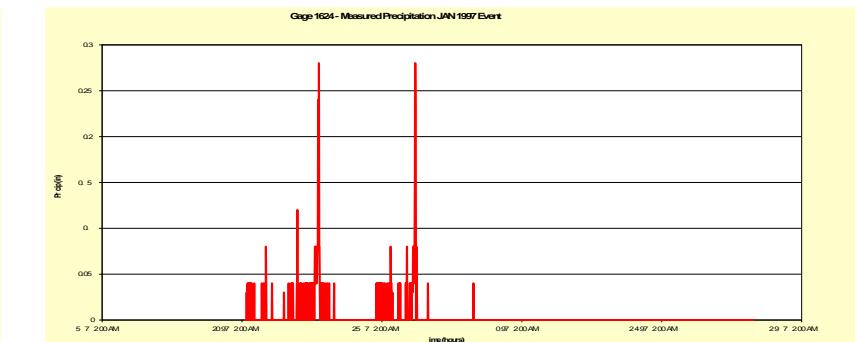
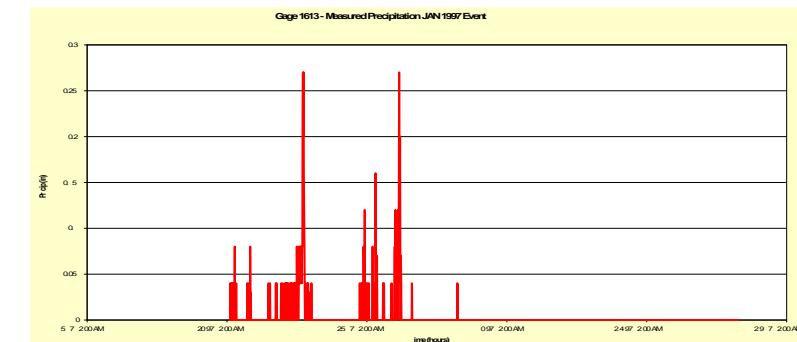
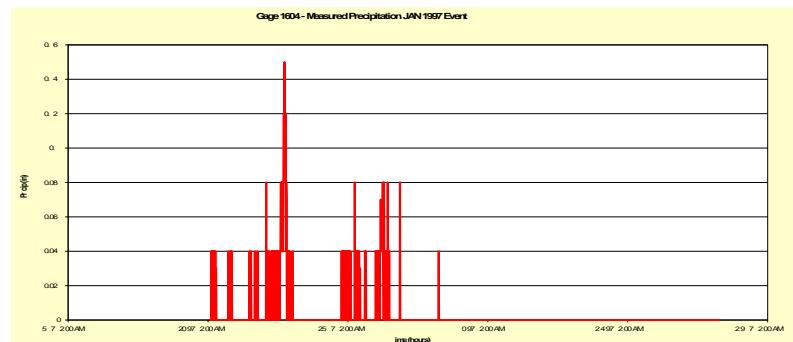


UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN

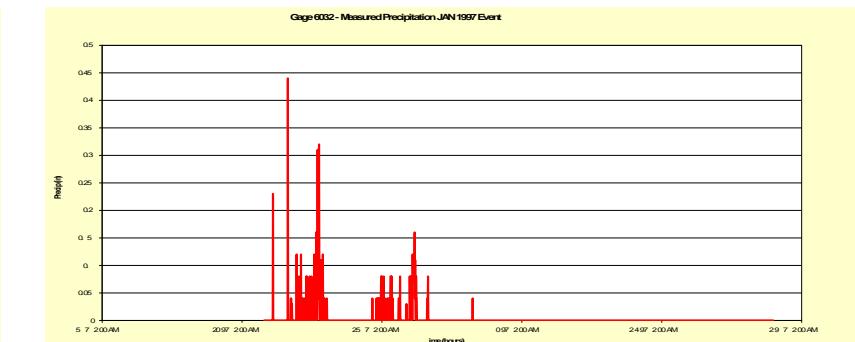
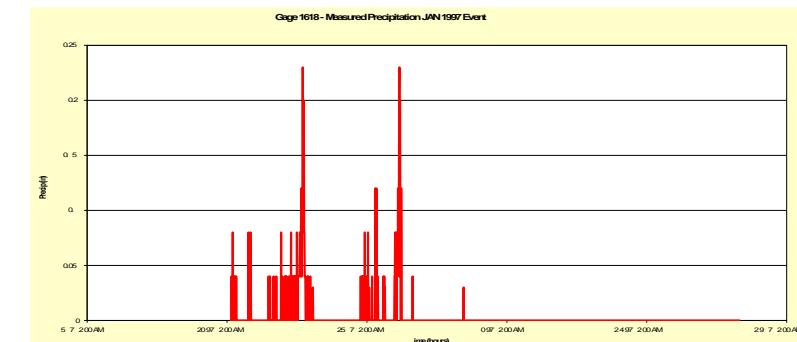
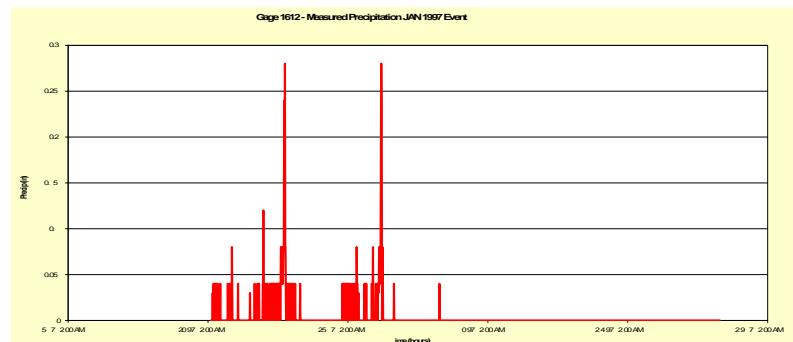
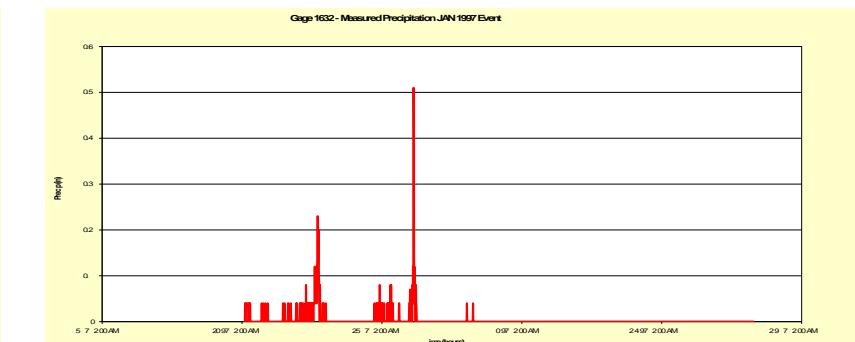
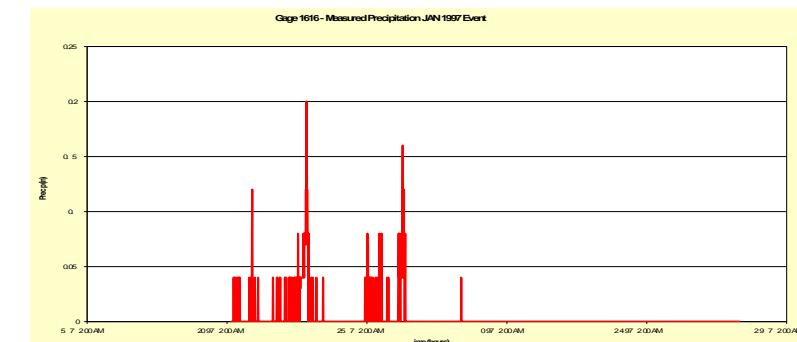
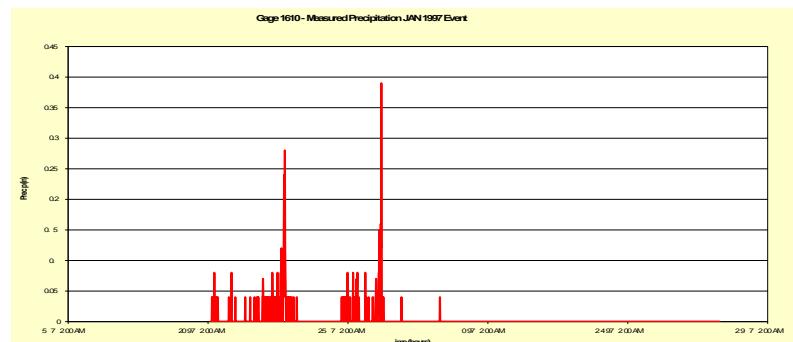
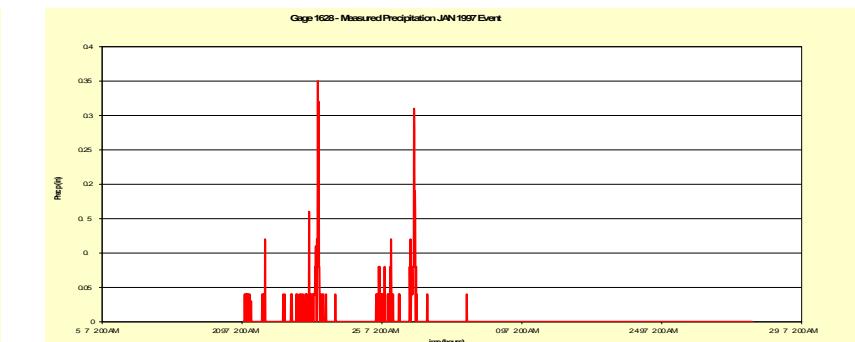
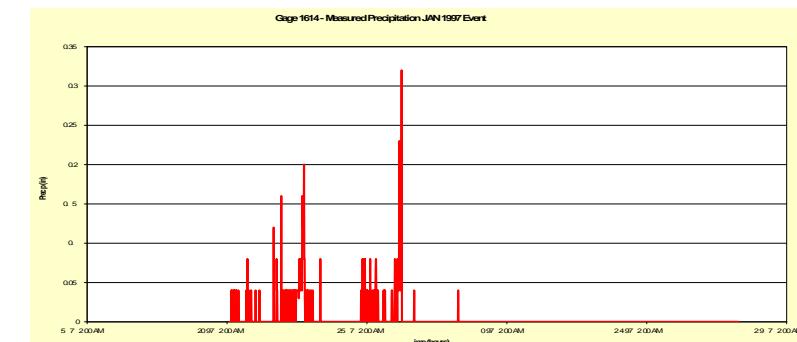


PLATE  
C-19

# JANUARY 1997 EVENT RAINFALL BY GAGE



**GAGE 1608  
BAD DATA**



## January 1997 event

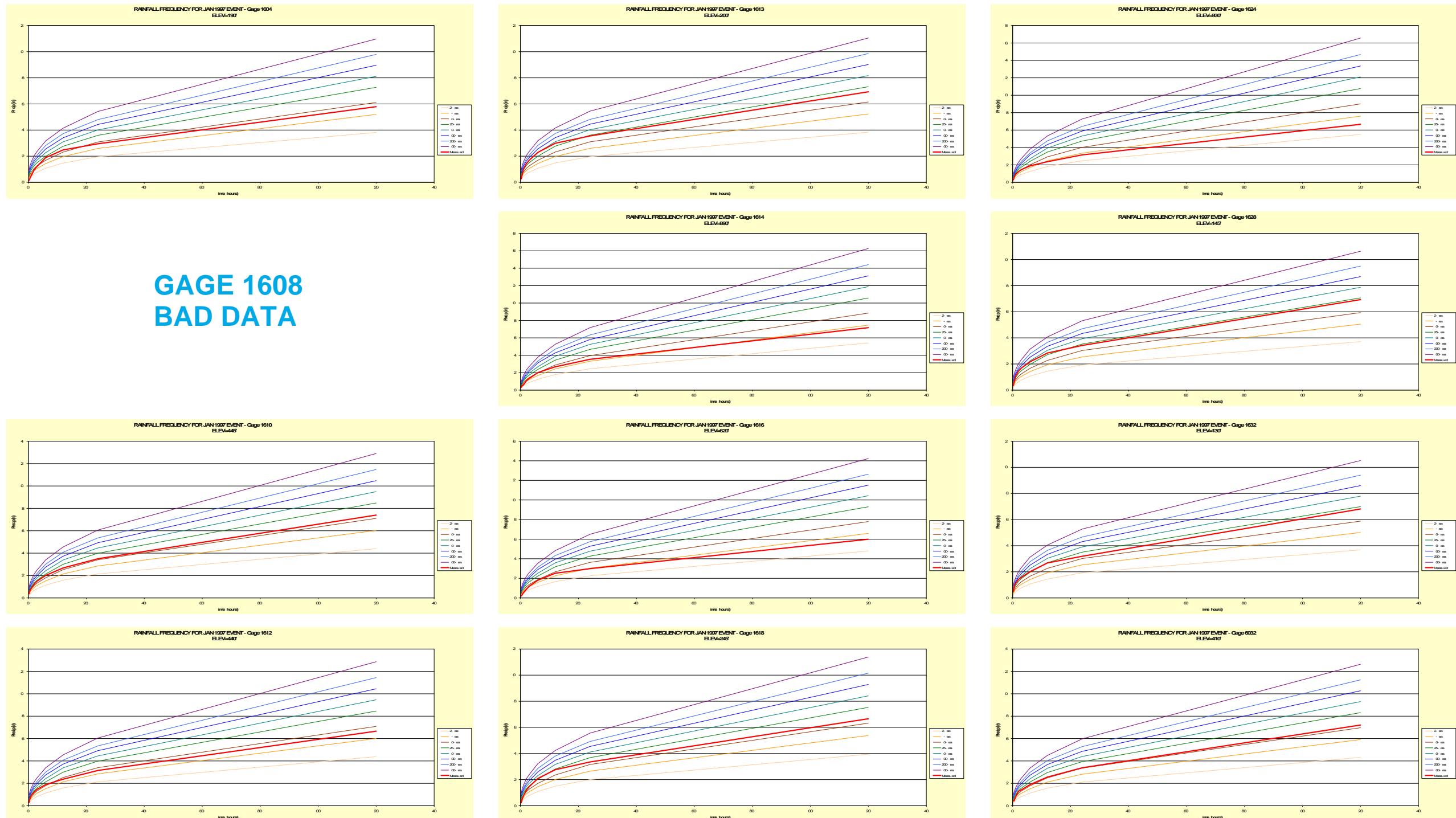
Most Gages reported 10-year recurrence for 24 hour event.

Varies between 5-yr and 50-yr precip.  
5-year at gage: 1624  
50-year at gage: 1613

24-hour precip varied between: 2.95 3.55  
12-hour precip varied between 2.37 2.99  
6-hour precip varied between 1.81 2.29



# JANUARY 1997 STORM EVENT RATING BY GAGE



January 1997 event

Varies between 5-yr and 50-yr precip.

5-year at gage: 1624

50-year at gage: 1613

Most Gages reported 10-year recurrence for 24 hour event.

24-hour precip varied between: 2.95 3.55

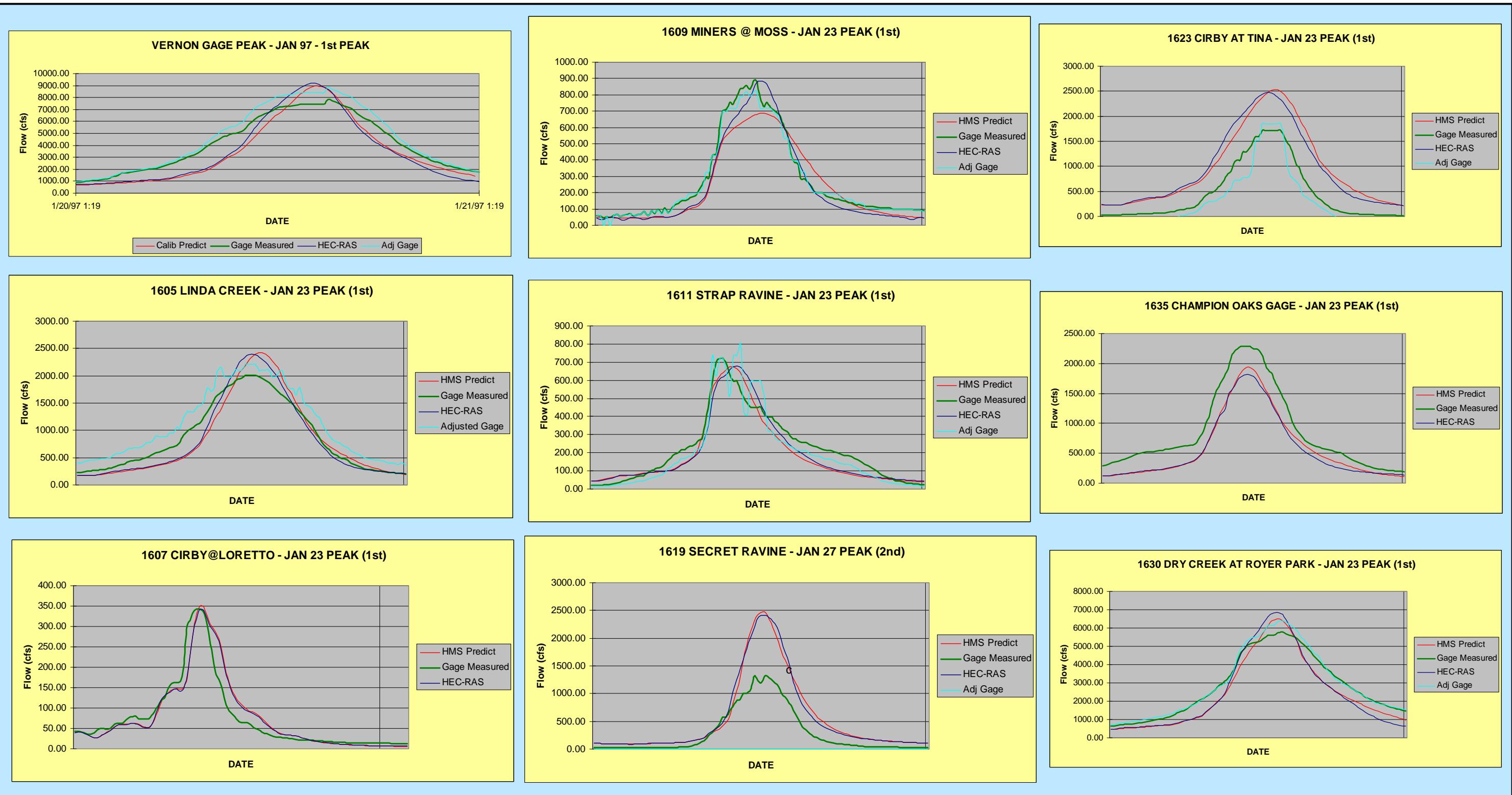
12-hour precip varied between 2.37 2.99

6-hour precip varied between 1.81 2.29



PLATE C.21

# JAN. 1997 -PEAK EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL

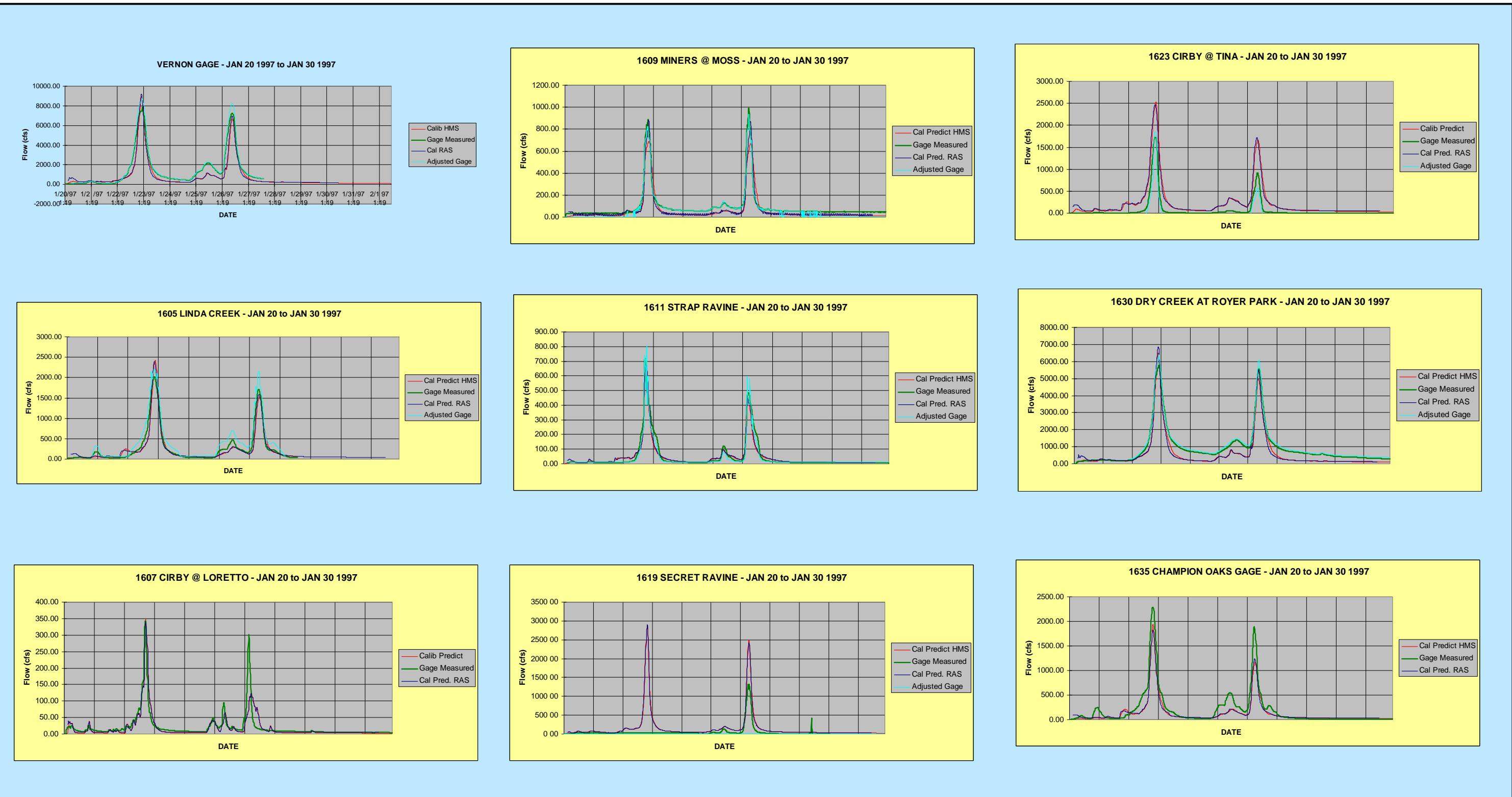


UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN



PLATE  
C-22

# JAN. 1997 - WHOLE EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL

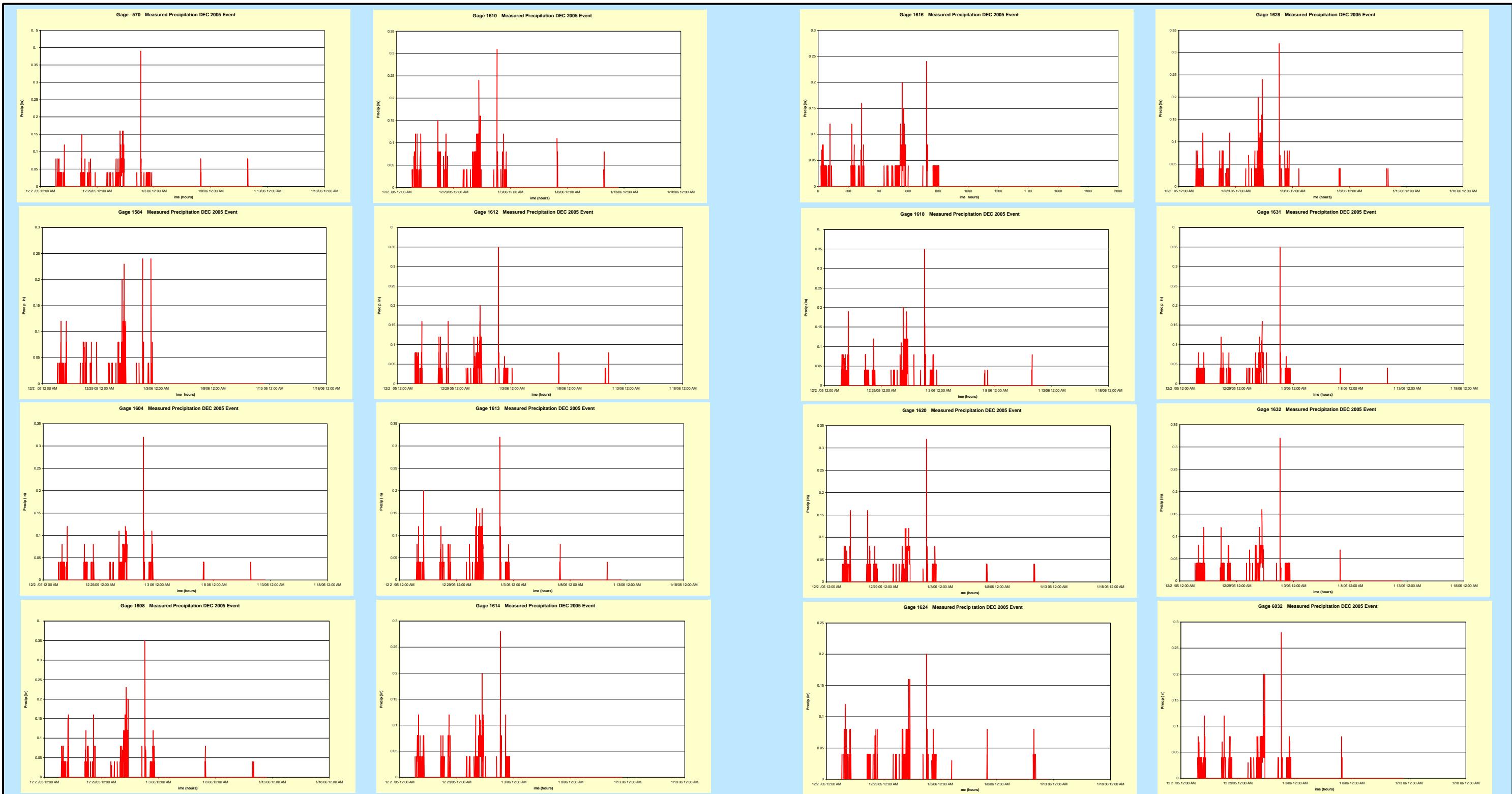


UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN



PLATE  
C-23

# JANUARY 1997 EVENT RAINFALL BY GAGE



December 31, 2005 event

Varies between 2-yr and 50-yr precip.  
2-year at gage: 1624  
50-year at gage: 6032

**Most Gages reported 10-year recurrence for 12 hour event.**  
24-hour precip varied between: 2.55 3.82  
12-hour precip varied between 2.12 3.3  
6-hour precip varied between 1.26 2.16

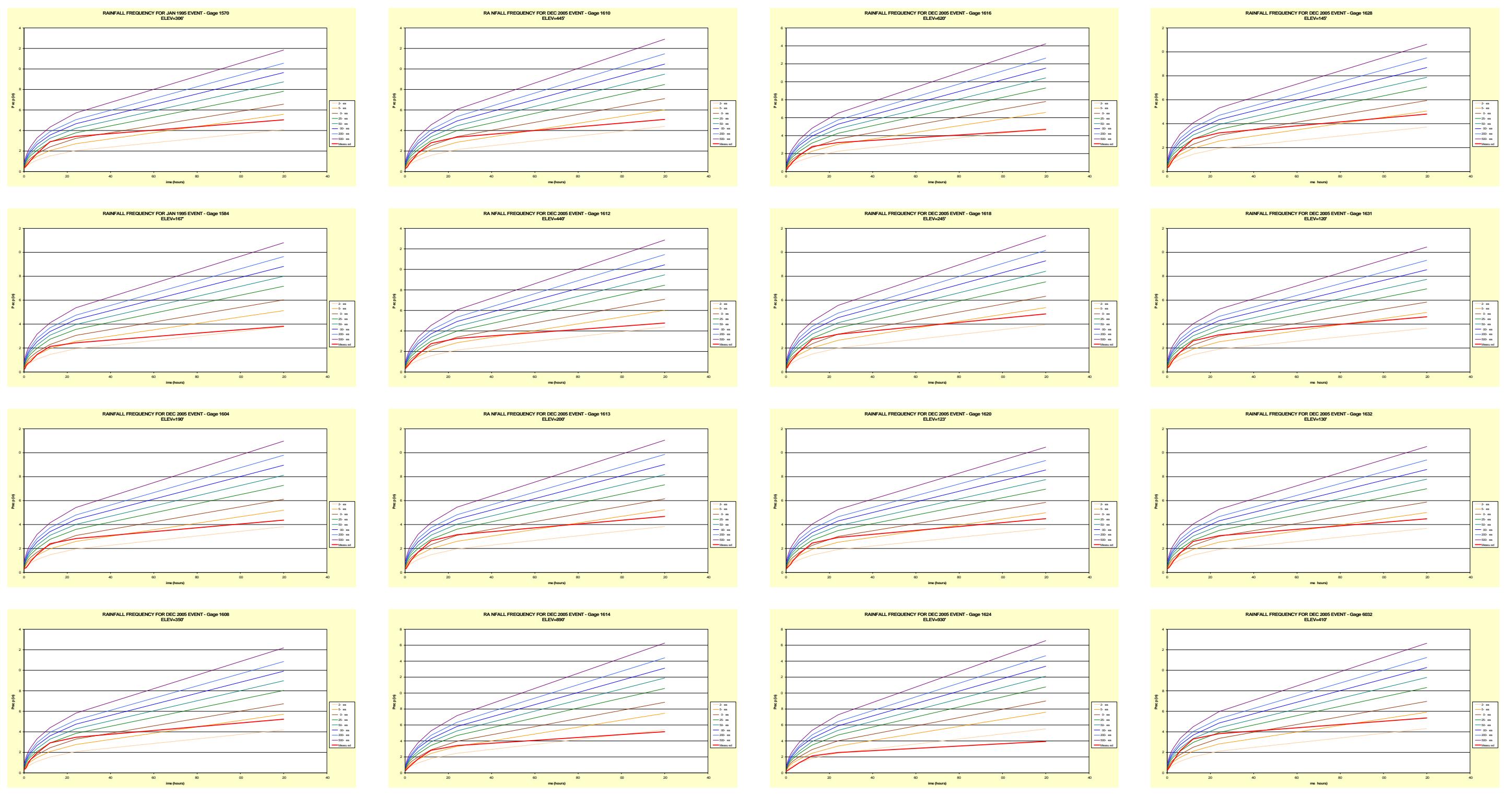


UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN



PLATE  
C-24

# DECEMBER 2005 STORM EVENT RATING BY GAGE



December 31, 2005 event

Varies between 2-yr and 50-yr precip.

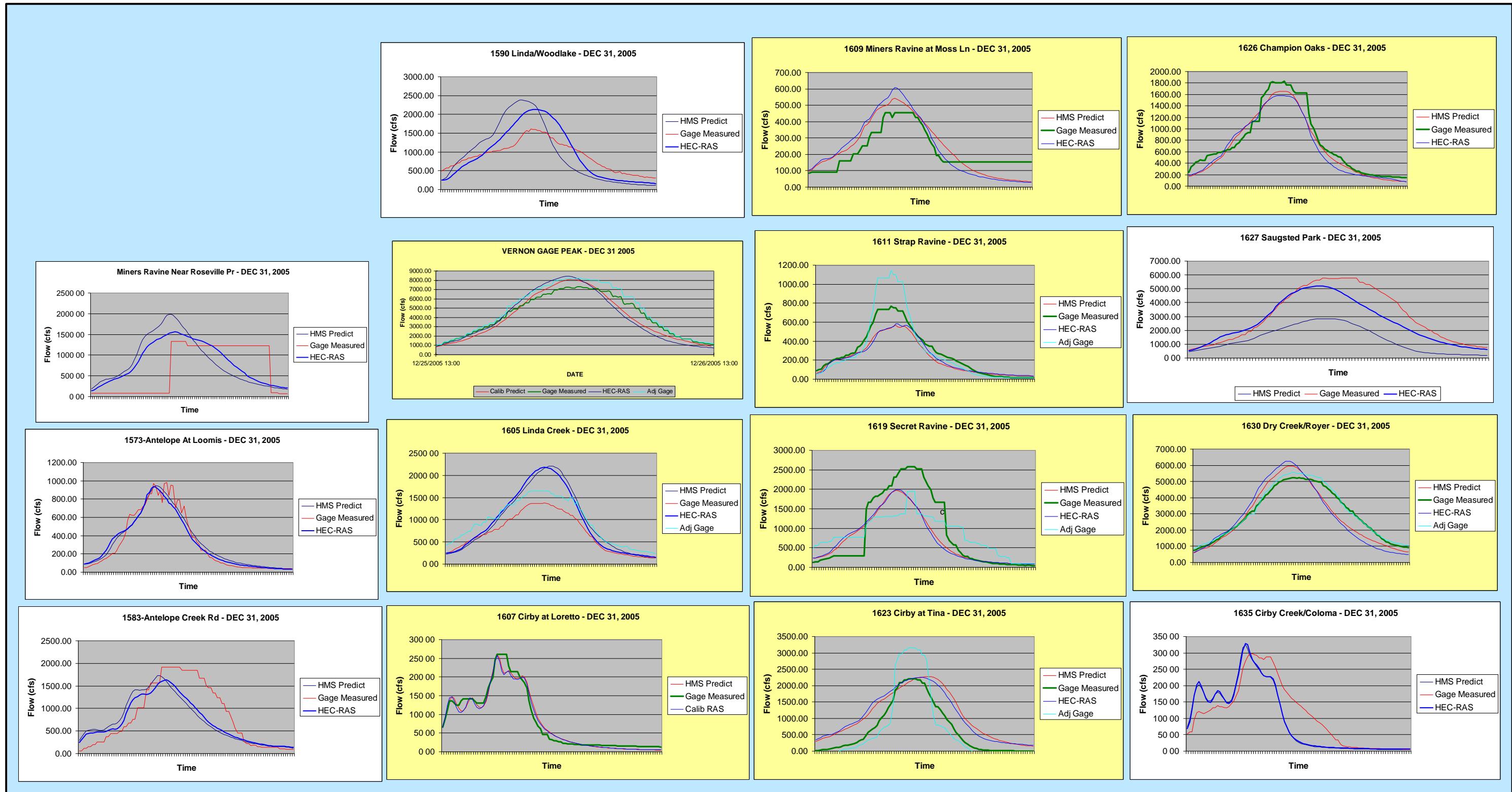
2-year at gage: 1624  
50-year at gage: 6032

Most Gages reported 10-year recurrance for 12 hour event.

24-hour precip varied between: 2.55 3.82  
12-hour precip varied between 2.12 3.3  
6-hour precip varied between 1.26 2.16



# DEC. 2005 -PEAK EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL

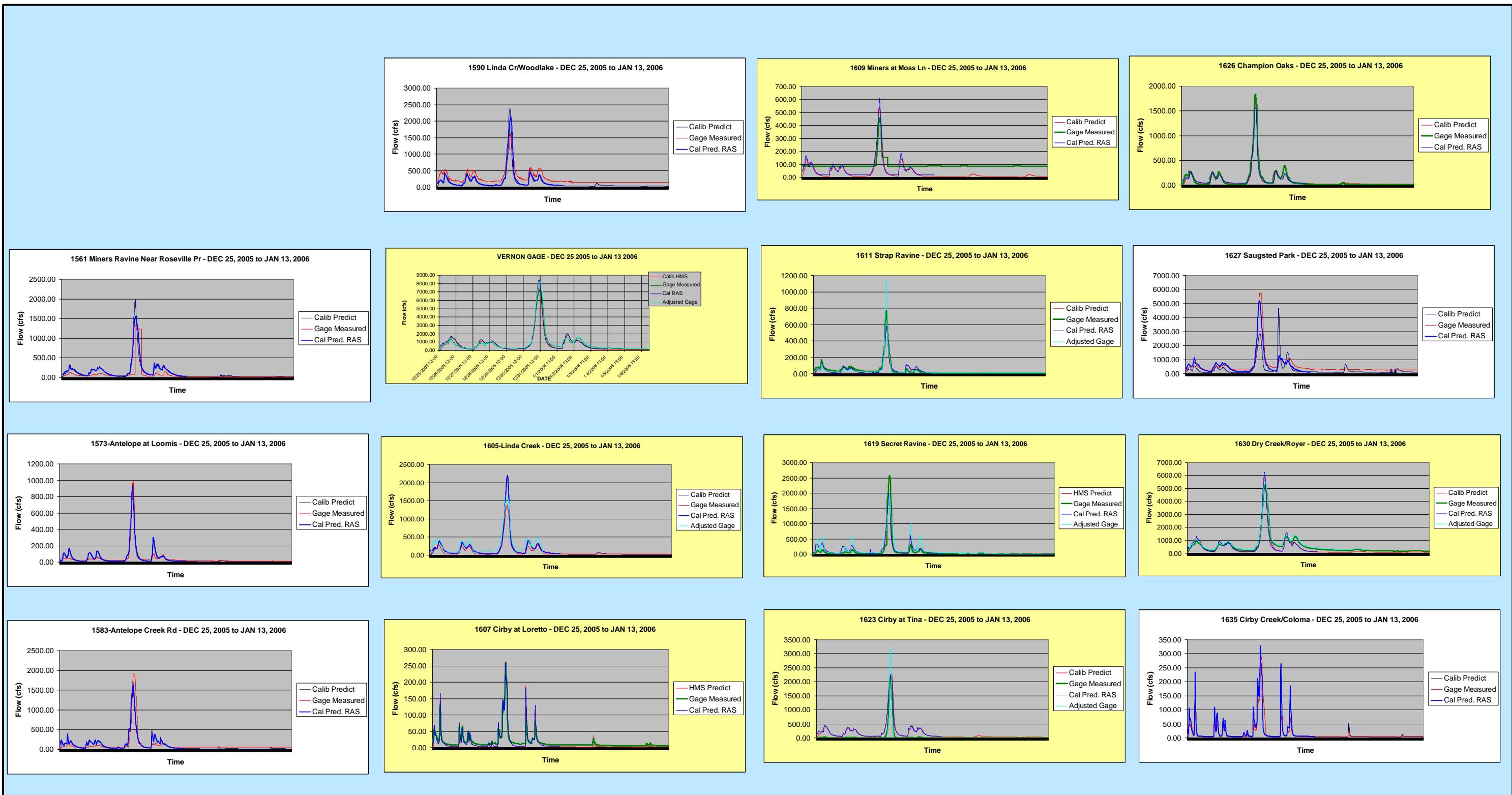


UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN



PLATE  
C-26

# DEC. 2005 - WHOLE EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL



UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN



PLATE  
C-27